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ERRATUM.

Vol. 34, No. 5, p. 398, PENSO's summary on the action of calcium cyanamide, the penultimate sentence should read :

" With *Cercaria burti* [solutions of calcium cyanamide in strengths of] 2 per thousand killed all in 3 minutes and 1 *per thousand* in 5 minutes."

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TROPICAL DISEASES BULLETIN.

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[No. 1.

HOOKWORM ANAEMIA.

AN OUTLINE IN BASIC OF PRESENT KNOWLEDGE AND OPINION.*

By Lieut.-Colonel CLAYTON LANE, M.D., I.M.S. (retd.)

Sectional Editor, Tropical Diseases Bulletin.

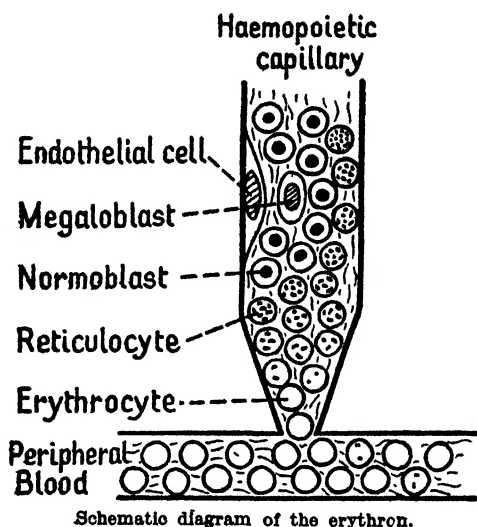
Hookworm anaemia is not a disease by itself, not a thing separate from all other anaemias, and as long as it is so viewed clear knowledge of it will not be possible. Being an anaemia it has something in common with all anaemias, being a microcytic hypochromic anaemia it will probably have most in common with other anaemias of this sort; so it seems wise to take the investigation of its cause in this order—firstly a short account of the structure and working of the erythron, secondly some examples of other anaemias which are seeming pointers to the way in which hookworm anaemia is caused, and thirdly, some account, with my notes on them, of certain important investigations into hookworm anaemia itself. But before doing so this has to be said. Seeing that in some countries most persons have hookworm infection, and that this infection does not keep off other diseases but has quite the opposite effect, there may be other sorts of anaemia from other causes in those harbouring these worms. This does not make the value of what will be said here any less, though it does make it very necessary to be as certain as possible that any anaemia present in a person with hookworms has been caused by them.

The erythron and haemopoiesis.—The erythron is the name given by BOYCOTT (1929) to the red cells in the blood and to that series of cells in the bone marrow from which they take origin. The size of the marrow is possibly 1,400 c.cm. and of the blood in the blood vessels 4,000 to 8,000 c.cm., so that without plasma the size of the erythron may be taken as not less than 2,500 c.cm. (WITTS, 1932).† All the erythron is inside blood vessels. One blood sinus of the bone marrow

* The framework of this paper is in Basic English. But for some special medical words, most of which are judged by the writer to be international, no words are used other than the 850 words of the everyday Basic List and the hundred words of the General Science List.

† Most of this part of this note is based on these Goulstonian Lectures and on Janet Vaughan's *The Anaemias* (1934).

is joined to another by capillaries, by division of whose endothelial cells the great megaloblasts are formed with poorly colouring nuclei (Fig. 1).



Schematic diagram of the erythron.

Fig. 1.

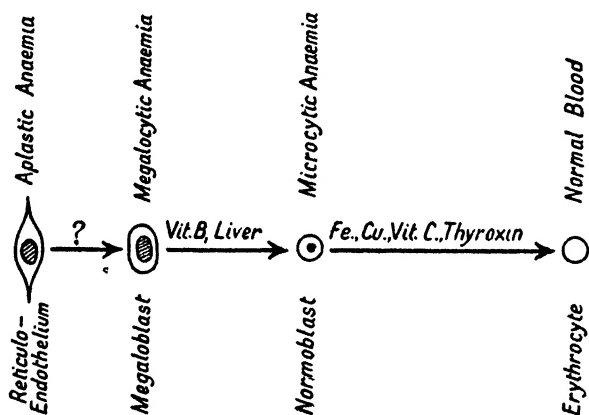
[Reproduced from the *Lancet*.]

From the megaloblasts comes a series of erythroblasts whose nuclei when division goes on take the basic colouring more and more deeply. At last their size is little greater than a red corpuscle and their cytoplasm, at first somewhat basophil (basophil normoblast), in time takes more of the eosin colouring which gives it a "pale violet to pink purple colour" (polychromatic normoblast) and then a "pure pink" (the ripe or orthochromatic normoblast). In the end the erythroblast becomes an erythrocyte by loss of its nucleus.

But in the young erythrocyte bits of the basic-colouring cytoplasm of the basophil erythroblast are still present, and come to light with "vital staining" as a network or reticulum, from which fact the cell gets its name of reticulocyte.

Before any cell of this series is able to undergo development it has to take up into itself a special substance coming to the body with the food, a different one for every stage (Fig. 2). There is little knowledge of that needed for the change from reticulo-endothelium to megaloblast. For that from megaloblast to erythroblast, the substance for special note here, the "haemopoietic factor" of Castle, comes to the marrow from the liver, and though stored in the liver it is made in the stomach, seemingly in this way. An enzyme, named haemopoietin or "intrinsic factor," is normally present in the secretion of the stomach; it comes into operation there with some substance in protein food, named "extrinsic factor," to make the "haemopoietic factor." This last gets into the body at any point in the wall of the small intestine, after which it is stored in the liver till the marrow has need of it. For the change from erythroblast to erythrocyte the substance, needing special note here, is iron. "Iron is taken up by the nuclei of erythroblasts which elaborate haemoglobin from it and are extruded from the

ripening cell when their task is completed." (WITTS, 1936.) As noted earlier, the iron normally comes to man in food, but the amount in which it is present there is no necessary measure of its value for blood-making—for these reasons. Before its use in the body is possible it has to be put into, and kept in, solution by the operation of the hydrochloric acid (HCl) in the stomach's secretion. But only about half the iron in food seems to go into solution in this way, that is to say only that part which is in, or may readily be made to take up, a simple form; and haemin compounds are not in this part. Again, only about half the iron which has gone into solution is taken up into the body and so becomes of possible use in the making of red cells. But though so much acid is formed in the stomach that the reaction through all the small intestine is acid, most of the iron is in fact taken up into the body in the duodenum and is then stored in the liver and other parts of the body. In other words, before it is possible for there to be normal blood making (haemopoiesis) it is necessary for there to be in the secretion of the stomach "haemopoietin" and hydrochloric acid and, in the food, a protein and iron in a somewhat simple form, for "haemopoietic factor" to be stored in the liver, and for carriage of it and of iron to the bone marrow to take place as necessary.



Scheme of anhaemopoietic anaemias showing point of action of the substances essential for blood formation.

Fig. 2.

[Reproduced from the *Lancet*.]

After an erythrocyte has been formed it has an existence of about thirty days and is then "threshed to bits." The first sign of its coming end is an outcurving of some part of its edge, a change in outline, which gives it the name of poikilocyte. When this outcurving has been broken off from the cell, this is left by so much the smaller (microcyte), and the broken bit is taken up by, and undergoes digestion in, the reticulo-endothelial system, bilirubin and iron being end results of this process. Normally the greater part of these two substances is made use of again and again for the forming of new red cells, the iron being stored till needed in the liver and other organs.

But this roundabout does not go on without waste of iron. In a man, the mean loss is about 1 mg. a day. In a woman with a normal loss every month of about 4 oz. of blood (or 50 mg. of iron) a mean iron

intake of 11 mg. a day is not enough to keep the balance level; the mean demands of pregnancy are 3.2 mg. of iron a day; after the baby's birth the mean loss of iron to the mother in her milk is 1.1-1.5 mg. a day.*

But this waste, or any other draining of iron, will not necessarily have an effect on the output of red cells by the bone marrow. Even when, for a time, less iron is coming into the body than is going out of it, the marrow will get its needed supply from the body's stores of iron, as long as there are any. Again, when there is an increased loss of iron, and at the same time an equal or greater amount is taken in, the bone marrow will still have enough of it to do its work of making red cells. Lastly, when the two supplies together are no longer enough for the needs of the marrow, haemopoiesis no longer goes on normally, and it is well to keep clearly in mind the reason for this, true at least in general. It is not because there has been damage to the machine—that is in good order—but because the material necessary for the output of good work simply is not there.

The amount of haemopoiesis taking place at any time in the marrow may generally be measured by the amount of red marrow in the long bones. At birth all marrow in all bones is red; with increasing age it becomes yellow, first in the fingers and toes, then in the lower ends of the tibia, fibula, radius and ulna, and, when completely yellow in them, it becomes so in the lower and lastly in the upper ends of the femur and humerus; when a person is 24 years old the upper part of the femur is generally without red marrow, this being limited to the bones of the trunk; the red marrow has become much smaller in the last four years. If there is now a need for more blood making, the yellow marrow in the long bones changes to red in the opposite direction and order, starting from the trunk and ending with the fingers and toes; the blood making machine becomes greater in size. But if the material needed for its work is not at hand, this is not done completely. With all the signs that haemopoiesis is going on in the marrow, the output of red cells may be small.

The rate at which red cells are made is probably controlled by the oxygen tension of the marrow, a low tension giving an increased rate.

The normal haemoglobin level.—The question of the normal amount of haemoglobin in the blood was gone into in the pages of the *Lancet* in 1929 and 1931. About thirty years earlier HALDANE and Lorraine SMITH, from investigations of 24 healthy men, made the discovery that every 100 c.cm. of blood was able to take up 18.5 c.cm. of oxygen; in other words that this quantity of normal blood had in it 13.8 g. of haemoglobin. So they took this point as 100 on the scale of their haemoglobinometer. Their normal figure for women was 91. The makers of other instruments have other normals. "It is not generally known that the Sahli instrument accepts 17.2 g. of haemoglobin per 100 c.cm. of blood as 100 per cent., the Newcomer standard is 16.92 g., whereas the Tallquist scale is set on a basis of 15.8 g. This wide variation in the accepted standard is merely a reflection of the inaccurate basis on which these figures have been calculated" (Dyke, 1929).†

* The need of an older boy or girl for iron is greater than that of a man.

† The British Standards Institution which is at work on the haemocytometer is turning its attention to the haemoglobinometer.

HOLIDAY, KERRIDGE and SMITH (1935) have gone into the question of the amount of haemoglobin in the blood, pointing out that there are difficulties in the use of colour as a test, that the use of dry haemoglobin weight is not at present a safe base for comparison, that there seem to be two forms of haemoglobin in blood and so it may not rightly be taken as certain that their chemical reactions are the same, that the photo-electric measuring of light which has gone through haemoglobin solutions and of iron are good and that "modern methods of measuring extinction co-efficient are accurate to within 2 per cent." Their belief is that the normal is so different in different places that it will have to be fixed separately for every place. In other words it is not at present possible to have a common measure with readily fixed "standards." But much knowledge may be got without this, if note is made of the instrument used. Thus PRICE JONES in 1931 made tests on 100 healthy men and 100 healthy women in England by the Haldane instrument and his mean haemoglobin in men was 105.4 and in women 98.3. He took the same haemoglobinometer to Boston (U.S.A.) and got with it a mean haemoglobin value in 20 men of 112.25, while DILL in the same men, using the van Slyke method, got 111.8, and WRIGHT using the Haldane instrument got 109.2. On this the *Lancet's* hope (1931) was that the 100 level on the Haldane instrument would not be changed, because the only thing needed was the knowledge of the power of the blood for the carriage of oxygen; and it made the point that, in Buenos Aires, Orias had mean haemoglobin figures of 103 for soldiers, 111 for students and 97 for women. In 43 healthy Indians, teaching in the Calcutta School of Tropical Medicine, the mean figure to the Hellige instrument was 105.9 (NAPIER, 1934).

Making use of the method of Osgood and Haskins in Portland, Oregon, OSGOOD (1935) got a mean haemoglobin, in seemingly healthy persons fourteen years old and over, of 115 (100 to 130) among 259 males, and of 100 (85 to 115) among 152 females: and by the Haldane instrument McGEORGE (1936) had a mean of 110 per cent. (94 to 125) in 50 medical students in London. It is then clear that the point 100 on the Haldane instrument is not high enough to be taken as the normal haemoglobin level for men, and that the blood of these, if they have anaemia caused by hookworms, has to be lifted not to but over 100 before they may rightly be grouped as healthy. Unhappily not enough attention is being given to these observations.

Two other Anaemias.

Hypochromic anaemia of pregnancy.—In investigations by DAVIES and SHELLEY (1934) on this, the commonest, anaemia of pregnancy, the bloods of all babies at birth had a full amount of haemoglobin and red cells, but five of six mothers had haemoglobin of 41 to 66, in only one of these was the secretion of the stomach normally acid, the food of two was said to be good, of four to be poor. The worst case of anaemia with haemoglobin of 41 gave birth before full time to two babies whose haemoglobin values were 150 and 148. There were other conditions which may probably have been the cause of poor blood-making in five of six anaemic mothers, but the point to which it is desired to give weight here is that the iron stores of every mother were clearly so used up by her baby that there was not enough iron for the needs of the mother herself. From the point of view of biology the foetus is in fact a parasite, getting food and safe keeping from its mother and causing

in her a loss of iron so great that it has, in certain conditions, a serious effect upon her well being.

Poor food as a possible cause of anaemia.—The condition of being without enough good food, and specially food with much iron, is so common in the tropics among those groups in which hookworm infection is greatest, that it is most difficult, in fact generally impossible, to say what bad effects may be caused in these persons by wrong food and what by hookworms. Happily observations on poor food as a possible cause of anaemia have been made in places where there is no hookworm and, as will be seen later (p. 10), on those with hookworms whose food is good in amount and quality.

Tests on persons taking food poor in iron were made in Aberdeenshire by DAVIDSON *et al.* (1933). In 115 families taken from among the poorest, every person had a mean intake of 11 mg. of iron a day, and a number of them were healthy with normal blood even when their iron intake was 6 mg. a day. "In short," these writers say, "provided no demands for additional iron were present . . . no person was found to be taking a diet so poor in iron that an anaemia could be attributed to direct iron deficiency." In point of fact, there were two groups among them, 795 men and young persons between 5 and 14 years old, and 455 women; in the first group there was almost no anaemia, but almost half the women had it; so it is clear that the chief cause of their anaemia was the draining away of iron in one or more of three ways—in the loss of blood every month, in the building up of the foetus, and in the milk. It was not caused by an intake of iron less than that necessary for the normal needs of the body, if the iron losses of women caused by sex are put on one side; it was caused by the greater loss of iron which comes about by reason of sex. Putting first things first, loss of iron from the body was the cause of the anaemia which these Scottish women had; their food made it hard for them to take in enough iron for the loss to be overcome; but the overcoming of the loss came second, the loss itself came first.

The Cause of Hookworm Anaemia.

In these two examples, anaemia has come into being because of an increased loss of iron caused by physiological parasitism or by loss of blood, the machine itself—the metabolism—being in good working order. If in hookworm anaemia the machine is in good order, then the balance of metabolism in the bone marrow is wrong. On which side is the true error; is it on that of iron intake in the food and of such iron stores as there are in the body, or on that of iron loss caused by the worms? If in the treatment and in the prevention of hookworm anaemia we are to put first things first, we have to be very certain of the right answer to this question.

As was pointed out by FÜLLEBORN and KIKUTH (1929) there has been much doubt as to how hookworm anaemia is caused. Suggestions have been—loss of blood, toxins which may do damage to red cells or to the marrow which makes them, and wrong metabolism. After discussion of these points themselves, there will be an attempt to make the position clear by examples from certain papers with the addition of my views on them.

Loss of blood.—That loss of blood is certainly caused by hookworms was made clear enough by WELLS (1931) even to those who had taken up the position that they had seen no blood in worms which were taken from the intestine of a dead host. We have knowledge that blood is

kept in the worm's intestine for a short time only, and Wells, using *A. caninum* and a special box placed in the open small intestine of a dog, made a comparison between the number of red cells which came away from a worm's anus and those in the same dog's blood. If there is no solution of red cells, no haemolysis, in the hookworm's intestine, every worm took a mean amount of 0.84 c.cm. of blood from the dog every day; but if there is such haemolysis this amount is not great enough. NISHI in like tests (1933) put the loss to the host as 0.7 c.cm. of blood for every worm harboured. FÜLLEBORN and KIKUTH gave an account of a dog with 1,100 *A. caninum*, its bowels had not been open for three days before its death and in them were 46.5 mg. of iron; this amount would be present in 456 c.cm. of the poor blood it had in its vessels three days before its death, the day on which its bowels were last open; every worm had then been the cause of a mean loss of at least 0.14 c.cm. of blood every day. Because the normal habitat of the worm is at a lower level than the duodenum, and because haemin compounds do not go into solution in any acid secretion which may get lower down the intestine, it is probably true that the amount of iron inside this dog's intestine was very near to that which had been taken as blood from its walls. Again, because *A. caninum* and *A. duodenale* are so alike in structure and size, what is true for the one may generally be taken as true for the other.

ASHFORD, PAYNE and PAYNE (1933, a, b) gave details of six persons whose infections with *A. duodenale* were got while sea-bathing. The worms which came away from them after anthelmintics numbered from 21 to 1,439. Five of the six had seen blood in their faeces; the sixth, a woman with 21 worms, had not seen any. "That there was blood in every case was later verified by microscope or chemical examination" (1933 a). More delicate tests, expertly made, gave a different answer from that of a simple test by a simple person. There was in fact an unmeasured loss of blood from all these persons, and a development in all of them of an anaemia with lowest haemoglobin levels between 17 and 67, it being 33 in the woman from whom only twenty-one worms were seen to come away.

In the same way in WHYTE's tests (1916) there was blood in the faeces when less than 20 worms came away later after anthelmintic treatment; there had been in the food of these persons no meat or blood for three days before the test, which was made with phenolphthalein and hydrogen peroxide.

Is this loss of blood a good enough explanation of the anaemia? In DE LANGEN's view (1933) it is not—for these reasons: In most, but not all, of his cases chemical tests of blood in the faeces gave a reaction as strong as that got when 2 to 3 c.cm of blood were taken by mouth, while after the driving out of the worms there was little or no reaction to the tests; from a sheep whose blood volume was put at about 3,500 c.cm., there were taken every week for four years 100 c.cm. of blood, and at the end of that time the animal was in first-rate condition with a normal blood picture. But it is not possible to give agreement to this reasoning. As to man, FÜLLEBORN and KIKUTH's experience of different tests for blood in faeces makes clear their different values: the effects of benzidine were so poor that they gave up its use, while in tests with guaiacum there was less error than in those with pyramidon. The sort of test used is very important, but DE LANGEN does not say which was his selection, so one has no idea of the value of decisions based on them. In addition he gives no reason for his belief that unworming

has really been effected, and most tests give no certain answer on this point even for female hookworms. He does not take into account the iron in the food or stored in the body; food and such stores were possibly (were they not certainly?) enough for all the blood making purposes of the sheep's bone marrow. His reasons against the view that loss of blood is great enough to be the cause of hookworm anaemia are judged not to be good ones.

There has been doubt as to the relation of these facts to hookworm infection generally, in part because blood is not seen in the faeces of every person with hookworms and in part because some of these cases have been so "acute." The limits of value of tests for blood in faeces have been noted, but of the degree of their error there seems little knowledge. As to this point being dependent in any way on the time for which infection has been present, Wells's dogs seem to have had theirs for some time, but even if they had not, the physiological process which he saw in the worm was so clear, and the motion of the oesophagus so special in act and rhythm, that it would be unwise to put forward without proof any suggestion of its being a behaviour which is not at all times normal to the worm; and if this motion is the same in new and old infections the effects on the wall of the bowel will be the same, that is to say there will be loss of blood from the wall of the intestine whenever the worms are taking food.

In controlled tests, then, in dogs and men there have gone together hookworm infection, loss of blood from the intestine, and anaemia. Loss of blood day by day (which is one of the certain causes of microcytic hypochromic anaemia) has then to be taken into account as a cause of the microcytic hypochromic anaemia for which hookworms are responsible.

Toxins.—In the view of FÜLLEBORN and KIKUTH, anaemia might be caused by toxins in one of two ways, through destruction of red cells or through damage to the blood making organs. As to destruction of cells, they got no proof that a haemolysin was present, because though there was a process of this sort in the test tube there was no such process in the living mouse, *Mus musculus*, and there was no iron in the livers of dogs with large infections, a place where it would have been stored if haemolysis were going on.* The resistance of red cells was normal, and no anaemia was caused by injection into mice of the serum of anaemic dogs, or by giving them as food living or dry dog hookworms. There was no discovery of toxin here; but the irritation present in "creeping eruption" is necessarily, in their belief, caused by a poison given out by the larvae. But this view is safe only if no bacteria were present in the liquid round the larvae, and on that point nothing is said by these workers. There are then no facts on which may safely be based any suggestion that toxins are a cause of hookworm anaemia.

Wrong metabolism.—The suggestion of such wording may be that the machine is working badly or that it has not enough of the right material for blood making. Of the first we seem to have little knowledge. How common the second is has been made clear, so that in that sense all blood making in the marrow is a question of metabolism. If the need for this is the result of blood loss, the way in which the loss has come about is unimportant from the viewpoint of the metabolism which has to put it right. It may for example have been caused by the

* DE LANGEN (1933) and CRUZ (1933) are in agreement that there is nothing to support haemolysis.

act of a parasite or by a badly done bit of cut-throat work, but in whatever way it comes about much will commonly have to be done before the doctor who puts first things first is able, with a quiet mind, to give any thought to helping metabolism by his line of treatment.

The position is that in hookworm infection there is a loss of blood, and so of iron, and that it is caused by the hookworms. Before the marrow is able to make more red cells, it has to have iron. It may get it from the food or from the body's stores, which in turn came from the food. If in one way or the other it does not get enough iron for its purpose the red cells which it makes are not made rightly, but there is no proof of any error in the machine itself caused by poison or in any other way. More light on this question will be got in that discussion of certain papers which is now taken up, with the addition to it of my views on their value based on my reading of present knowledge on the process of blood making.

Effects of Treatment as Pointers to the Cause of Hookworm Anaemia.

The purpose of treatment in hookworm anaemia is to get the haemoglobin to the normal level of over 100 for men by the Haldane instrument or seemingly by any other. It is hoped that the examples now to be given will make clear how generally this is not being done.

Twenty-five years ago ASHFORD and GUTIERREZ IGARAVIDEZ (1911, p. 136) put into these words their experience of treatment of many tens of thousands of persons in Porto Rico. "The object of treatment is, of course, to remove the cause by expulsion of the parasites. In many light and moderate cases this will suffice, but in old chronic cases and in those where the disease has reached a severe grade some regenerative treatment should follow the specific." And again (p. 135) "Each person who harbours this parasite, whether suffering from anemia or not, is a focus of infection for others; hence the reduction of these foci becomes an important prophylactic measure." In the view then of these writers unworming is a completely necessary first step in the treatment and prevention of hookworm anaemia, equally in the interests of the harbourers of worms and of those living near them; and after unworming the anaemia will generally get better of itself. In the light of what has gone before it is judged that the iron in the food and body stores of these Porto Ricans was generally enough to let the bone marrow do its work rightly. To those in whom it was not enough more iron has to be given.

Oswaldo CRUZ (1934a) puts the position as he sees it in these words. "The results presented show that the primordial factor in the genesis of Intertropical Hypohaemia, afterwards denominated Ankylostomiasis, lies in a dietary deficiency which produces an iron deficiency in the organism, thus conveying an anaemia which in its turn determines the main symptoms of the disease. Although the helminth is imputed as the single etiologic agent of ankylostomiasis, the direct action of the parasite, in the genesis of anaemia, is of very slight effects, always fairly less consequential than those due to the preponderant action of alimentary deficiency." This goes into Basic in some such words as these. Putting first things first, though the hookworm has been put first by others it has little effect in the causing of hookworm anaemia; it is food poor in iron which is the true cause.

In support of his statement CRUZ gave details of five persons who were not unwormed but had long treatment with iron, up to almost nine

months. With this they had increases of haemoglobin from 13 to 81, 20 to 74, 16 to 82, 23 to 76 and 30 to 94. Again (1934, b) he gave like treatment to twenty-five persons; before treatment their haemoglobin values were between 10 and 40 and after it between 62 and 91 (mean 77). Even with this long treatment CRUZ was quite unable, as long as hookworms were harboured, to get the haemoglobin back to the normal for Brazil. In most cases it was a long way under this level; he did not give proof of his statement that the worms are unimportant in the causing of hookworm anaemia. His facts take one in the opposite direction. Later (1934, c) he gave ten persons anthelmintics but no iron. The mean values of their haemoglobin before, and again after, this seeming unworming were 22 and 23 for the lowest figures and 38 and 75 for the highest. Two points have to be made here. I see in his paper no proof that these persons were unwormed. Even if they were the tests were not rightly controlled. In the making of controls it is completely necessary to undertake two series of parallel tests which are different, one from the other, only in one detail (LANE, 1927). The right way here would have been to give iron to all persons in the two series while making as certain as possible of the complete unworming of those in one series, and giving no anthelmintic treatment at all to those in the other; in place of this, comparison was made between those with iron and with worms on one side and those without iron and, it was hoped, without worms on the other. The tests were not rightly controlled and have no solid value, though the facts are an addition to our present knowledge that it is hard for marrow to make the blood normal as long as the body is being drained of iron by hookworms.

The same point came out in the investigations of ASHFORD, PAYNE and PAYNE (1933, a, b). Though given an anthelmintic from two to nine times (mean 5.2), 13 being with hexylresorcinol and 20 with carbon tetrachloride, not one of the seven persons in question was unwormed, and after taking iron freely and being kept under observation for a year they had in the end haemoglobin values between 74 and 80 (mean 76)—and they were well-off people taking good food. Once more the marrow was unable to make the blood normal, this time in persons who were taking good food, but whose iron stores had clearly been drained and who were still harbouring worms. Here is another pointer to the need for unworming if first things are to be put first in the treatment of hookworm anaemia.

In my view the same decision has to be made on the work done by RHOADS, CASTLE, PAYNE and LAWSON (1934, a, b), in whose opinion hookworm anaemia is caused by loss of blood going on for long, and by nothing else. Because the giving of 6 g. of iron and ammonium citrate a day "*with or without the removal of parasites*"* made the blood values and the clinical condition far better, they have made a point of "the practical importance of directing therapy first against the anemia in hookworm disease and secondly against the parasite." In an investigation whose purpose is the discovery of the effects of iron in those who are still, as against those who are no longer, harbouring hookworms, the first thing necessary is to be as certain as possible that those under investigation have been put into their right groups. The writers have not done this. By "direct examination," probably a "smear," they saw hookworm eggs in the faeces at the start, and as to unworming they let themselves be dependent

* So printed in their paper.

on hexylresorcinol, as being an "efficient anthelmintic," and for this last statement they take as their authority the work of LAMSON, BROWN, ROBINS and WARD (1931). But in the work under Lamson the number of persons who were still harbouring hookworms after treatment with 1 g. or more of hexylresorcinol given in water was 46 per cent. and if the rough methods of diagnosis which were used in this last investigation before treatment were used again after it, the number of those still harbouring worms after treatment was undoubtedly higher, possibly much higher; so one has no right at all to the opinion that in the work headed by Rhoads now under discussion the conditions were any different. That being so, Rhoads did not in fact put into different groups those who had been unwormed and those who had not; in work of the same sort on animals the attempt to do so is being made with greater care on this point, and in work on man it is at least as necessary to make use for this purpose of the best methods of which we have knowledge. These writers say "It is also not intended to imply that because anaemia can be totally relieved by the exhibition of iron without removing the parasites, the latter play no part in its production." In point of fact anaemia was not "totally relieved" by iron in any worm-harbouring person of whom they give details. For example in their Table 4 there are twelve persons who had treatment with 6 g. of ferric ammonium citrate a day for fifty days and who had had no hexylresorcinol; their mean haemoglobin after this treatment was only 68 (52 to 78) and no better results are seen in their other Tables. As has been pointed out, the normal haemoglobin value for healthy men is over 100 in all parts of the earth where it has been tested, so that the anaemia of these persons was far from being "totally relieved." A comparison with the results in the case of those who had been given hexylresorcinol is not any value as a control, because there is no proof that unworming took place in them. Rhoads and his group were not then able, by treatment with iron, to get the blood to normal in any person who was harbouring hookworms, in fact the mean figures were a long way under that level; there is good reason for saying that it was probably for the same cause that they were unable to get haemoglobin up to normal in those who had had hexylresorcinol—most of them were still harbourers of worms; but, after all, true decisions on this question will not be possible as long as use is not made of those methods of diagnosis which have the smallest error. Again these writers had in mind the testing of "the effect of only *one procedure at a time*."* Unhappily they did not put this into effect, because they made, in fact, no good division between those still harbouring and those no longer harbouring worms. Again, they say "Since the presence of worms without anemia is not necessarily detrimental to health, it should be possible to employ iron salts as a prophylactic, either alone or preferably in combination with anthelmintics." But to what degree are hookworms present in man without causing anaemia? FOSTER and LANDSBERG (1934) have put on record with surprise that this may be so in some dogs, but they give no details as to the amount of iron in their food, or in their bodies after death, and if these amounts were enough for the needs of the marrow there is no reason for anaemia to come about (seeing that toxins have no hand in its cause) than there would be in de Langen's sheep. As to man, RHOADS and his group possibly had in mind the work of SMILLIE and AUGUSTINE (1925, 1926),

* So printed in their paper.

but this was put through by methods by which small infections do not come to light, and again the mean haemoglobin value in persons judged by them to be free from infection was only 78 (LANE, 1932, fig. 29) ; these are not facts in proof of the belief that hookworms may frequently, or even sometimes, be present without being the cause of anaemia in man, and there seem to be no others which are seriously based on fact. However this may be, in the experience of the Rhoads group of workers, no person harbouring worms ever had normal haemoglobin. As to prevention, their suggestion is that this may rightly be limited to the treatment of one symptom of a disease, while doing nothing to put a stop to the distribution of hookworm eggs ; so that the person with infection is, in the conditions present among hundreds of millions between the 24th parallels, a danger to himself and to those living near him. As facts make clear, this line of prophylaxis is of very little use against anaemia and of none at all in keeping others from getting infection.

It is hard to put a value on the work in Egypt of BIGGAM and GHALIOUNGUI (1934). Diagnosis was by an unnamed floatation method but quite frequently great numbers of ancylostomes came away under treatment when no eggs had been seen in the faeces ; and their paper makes no note of the possible harbouring of schistosomes as a cause of anaemia. After iron treatment the mean haemoglobin was never as high as 80, and in most cases was less than 70.

Pathology as a Pointer to the Cause of Hookworm Anaemia.

PEÑA CHAVARRIA and ROTTER (1935) made an investigation into the matter in Costa Rica and gave details of 96 important necropsies. When death was caused by hookworms, there were no iron stores in the body, while in those in which there had been anaemias of other sorts and who had been taking the same food, iron stores were present ; they are quite certain that use may be made of this fact in separating one group from the other. Again most of these persons came from the Canton of Costa Rica, and in it less meat is taken than in any other Canton in the State. Taking them all together the marrow of the femur was red in 42 per cent., half or more of it in 36 per cent., and less than half of it in 21 per cent. Once more the only good explanation seems to be that there was first of all a loss of blood caused by the hookworm, something outside the normal waste of the body. And as, in Aberdeenshire, women taking poor food were not able to make good from it the iron losses normal to their sex (in which the needs of that biological parasite, the foetus, have an important place), so those harbouring hookworms in Costa Rica were not able to get from their food enough iron to take the place of those iron losses caused by the parasites ; the outcome being that the iron stores of the body become used up in them, but not in those with anaemias which are not caused by a blood-taking worm, but who had the same food. With its stores of iron gone and not enough of it in the food for normal blood making, the marrow did overtime, as one might say, but the erythroblasts were not able to get the right material for the normal making of the erythrocytes and the output of these was far from being enough. In this chain of events the loss of iron from the body was the first thing, the need to put it back came second ; and first things have to be kept first.

The Outcome of the Discussion.

Hookworms take blood, and so iron, from those who are harbouring them, and this is the first step on the road to hookworm anaemia ; this

loss has to be overcome by giving to the blood-making marrow iron from the food or from stores in the body, and this is the second step. When this loss has gone so far that serious anaemia is present, and when iron has then been given without unworming, the anaemia has become less ; but in this outline, which in my hope and belief has given an account of all papers which have weight here, no example has come to light of a case in which the haemoglobin has become normal under iron treatment so long as worms have still been present in the bowel ; in most the level has been very much under what in our present knowledge is normal. In the treatment of hookworm anaemia the first step has then to be the same as for hookworm infection, that is unworming, the second the putting back of iron into the body. This decision makes it the more important for there to be undertaken as quickly as possible an investigation, with open mind and on the right scale, to make as certain as possible what anthelmintic, new or old, is the best and safest ; seeing that, in the present living conditions unworming is the only way for the prevention of infection, or prevention or overcoming of anaemia, in hundreds of millions of those living between the 24th parallels. A small number of persons with serious anaemia from hookworms may when first seen be so seriously ill that it is unsafe to give them an anthelmintic straight away, and for them the danger of that increase of infection which may be caused by them to themselves and others will have to be put on one side till iron has made them in some degree better ; but that is a very different thing from saying that the treatment of a symptom, and of a symptom only, is normally the right thing to do for the person in question and for those living round him.

Let it be said once more : With almost everyone who is harbouring hookworms his medical man has first to put a stop to the loss of blood and iron which is being caused by the worms, and second to give iron to take the place of that loss ; and this order is equally the right one for the treatment of hookworm anaemia.

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HELMINTHIASIS.

CULBERTSON (James T.). **The Cercarial Action of Normal Serums.**—*Jl. Parasitology*. 1936. Apr. Vol. 22. No. 2. pp. 111-125. [15 refs.]

Cercariae die quickly in the sera of certain animals. The paper gives details of experiments which make this clear, with a discussion of the chemical body which is the cause of their death.

The sera of man, white rat, and cat, of the domesticated duck and herring gull, of water snake and green frog, and of the bull-head fish have been tested against a number of species of cercariae. Only the cat's serum was inactive to all. There was no proof that the age of the cercaria influenced the effect. A batch of cercariae from one snail may be killed much more readily than a batch from another snail of the same species using the same serum. If the serum is kept at 56°C. for 15 minutes or more the death rate among cercariae is the same as in normal saline, and after storage for 4 days there is no lethal effect on them, nor is there when serum has been mixed with dried cercariae or dried typhoid bacilli. But alexin is inactivated by a temperature of 56°C. Is it then alexin which is cercaricidal? No; for cat's serum contains alexin but is not cercaricidal. On the other hand the cercaria of *Schistosomatum douthitti* is not killed by duck serum, but this parasite is not infective for ducks. [There is then raised once more the question whether the well-known restriction of parasites in host and habitat is due to something in these hosts or habitats which is for them a poison, or to the lack there of something necessary for their special metabolism.] Clayton Lane.

KOMIYA (Yoshitaka). **Study on *Clonorchis sinensis* in the District of Shanghai. 2. On the Habit of eating Fresh Water Fish among the Japanese in Shanghai.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. Mar. Sect. IV. Vol. 2. pp. 61-73. [13 refs.]

The Japanese have the highest percentage of infection with *Clonorchis* among the races living in Shanghai.

Of 2,295 Japanese families questioned, 44.31 per cent. had a taste for fresh water fish and most of them liked it best raw, and ate it so all the year round. Naturally the children take after the parents, and as the Japanese make use of no river water for drinking or washing dishes the source of their infection is clear. C. L.

KAWANA (Hiroshi). **Study on *Clonorchis sinensis* in the District of Shanghai. 3. Dogs, Cats and Rats as Reservoir Hosts of *Clonorchis*.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. Mar. Sect. IV. Vol. 2. pp. 75-84. [24 refs.]

In 228 "field" dogs 36.62 per cent. were infected, of 15 house dogs none. This is probably because the former are scavengers or are fed with raw false dace or bitterling, small fish which are not eaten raw here by man. In 202 cats there were 57.92 per cent. infected (adults 69.37 per cent., young 14.28 per cent.). The mean weight of infection showed the same tendency, 195 flukes in cats and 26 in dogs. C. L.

KOMIYA (Yoshitaka) & KAWANA (Hiroshi). **Study on *Clonorchis sinensis* in the District of Shanghai. 4. The Second Intermediate Hosts of *Clonorchis*.**—Reprinted from *Jl. Shanghai Sci. Inst.* 1936. May. Sect. IV. Vol. 2. pp. 155–167. With 3 plates. [18 refs.]

“The writer made feeding experiments with 15 species of fresh-water fish ordinarily obtained from the market upon guineapigs, rabbits and young dogs and found 10 of them were the actual second intermediate host of *Clonorchis*. And among these 10 species three of them, namely *Culter alburnus* Basilewsky, *Parapelecus argenteus* Günther and *Elopichthys bambusa* (Richardson) have not been recorded as yet as the second intermediate hosts of *Clonorchis*.

“A brief description was made concerning these three species of fish.”

There are in addition a list of 43 second larval hosts and illustrations of the 3 new ones. C. L.

KAWAI (T.) & YUMOTO (Y.). **On the Distribution of the Encysted Cercariae of *Clonorchis sinensis* (Cobbold) in the Second Intermediate Host, *Pseudorasbora parva* (Temminck and Schlegel), and the Rate of their Infections to the Mammalian Hosts.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Apr. Vol. 35. No. 4 (373). [In Japanese pp. 880–887. [28 refs.] English summary p. 887.]

About half the cysts were in muscle, and 58 per cent. of them gave infection to cats after the fish had been 5 to 10 days in ice. C. L.

GALLIARD (Henri), PHAN-HUY-QUAT & DANG-VAN-NGU. Le troisième cas de distomatose pancréatique à *Clonorchis sinensis* observé au Tonkin.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Apr. Vol. 14. No. 4. pp. 379–383. [18 refs.]

GALLIARD (H.), AUTRET (M.) & PHAN-HUY-QUAT. Recherches sur l'insuffisance hépatique dans la distomatose à *Clonorchis sinensis* au Tonkin.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. May. Vol. 14. No. 5. pp. 444–447.

GALLIARD (Henri). Un nouveau cas distomatose pancréatique à *Clonorchis sinensis*. [*Clonorchis sinensis* in the Pancreas.]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. May. Vol. 14. No. 5. pp. 442–443.

The fourth case from Tonking.

C. L.

VOGEL (Hans.). Beobachtungen ueber Fasciolopsisinfektion. [**Observations of Fasciolopsis Infestation.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. May. Vol. 40. No. 5. pp. 181–187. With 5 figs.

Observations on the carriage of *F. buski* in Hsiao-shan in the province of Chekiang, China.

It was not found possible to infect in Hamburg *Planorbis schmackeri* and *Segmentina nitidella* brought from China. In an autoinfection 4 cysts were swallowed, 35 days later there was colic, at the end of 6 months the infection disappeared. Eosinophilia was up to 19 per cent. There were no other symptoms. For one adult there were counted 126 eggs per gram of faeces. C. L.

WALLACE (F. G.). **A New Intermediate Host of *Fasciolopsis buski* (Lankester) (Trematoda : Fasciolidae).**—*Lingnan Sci. Jl.* (continuation of *Lingnaam Agric. Rev.*). 1936. Vol. 15. No. 1. pp. 125–126.

Cysts having the appearance of those of *F. buski* were found in the small planorbid snail *Segmentina calathus* Benson in the village of Boon Tong on the north-west border of Canton where there is a high incidence of this fluke in man. The percentage of infection in 450 snails was 0.66.

"*Segmentina calathus* is one of the most common planorbid snails in the vicinity of Canton. It is found in shallow ponds and paddy fields devoted to the cultivation of aquatic plants where it may be found floating on the surface of the water or adhering to vegetation

"It is very small, the largest specimens measuring 4.5 mm. in diameter and 2 mm. in height. The shell is rounded on top with the apex sunken and consists of about four whorls. It may be distinguished from the other planorbids which share its habitat by the three radiating internal ridges or teeth on the ventral side of the outer whorl. As far as can be determined from the literature at hand this species which is abundant in parts of India has not been reported previously from Kwangtung."

The snail was identified by PILSBRY.

C. L.

WANG (M. S.) Ueber die Krankheitserscheinungen bei Infektion mit *Fasciolopsis buski*.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. June & July. Vol. 40. Nos. 6 & 7 pp. 243–255, 295–301. [37 refs.]

WU (Kuang). Distribution of Paragonimiasis in China. 1. Chekiang Province.—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 442–448. With 1 map.

CHEN (H. T.). **Further Notes on the Life History of *Paragonimus* from Rats.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 368–378. With 10 figs. (5 on 2 plates). [10 refs.]

In a small village, Ue Lok Chuen, adjoining the Campus of the Lingnan University, Canton, *Mus norvegicus* is a common natural host of *Paragonimus*, a new record. In 100 pigs from Canton slaughter-houses there was no infection. The snail host is *Assiminea lutea* and the crab hosts *Sesarma* (*Sesarma*) *sinensis* and *S. (Holometopus) dehaani*, the first two being new [they are not illustrated]. The snail is small, amphibious, and was seen in foul water between mulberry beds and attached to stones and plants. Every crab has its own wide hole above water level in which it takes refuge when there is need to do so.

C. L.

KAU (L. S.) & WU (K.). **Preliminary Report on Histopathology of Paragonimiasis in Cats in China.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 101–105. With 6 figs. on 3 plates.

The report deals with the pathological anatomy of the lungs of cats who have this infection.

As the authors note, the slow course of the disease in man brings few patients under qualified doctors, and even if they do come under them autopsies in China are almost impossible to get. So study of the pathology in cats may be valuable. Congestion and oedema with much collapse though with emphysematous edges to the lung are the rule. The degree of fibrosis varies. Cysts may or may not have worms in

them. [In view of conditions now being disclosed in *Metagonimus* infections in man, it is of interest to note that distorted ova are found embedded not only in the fibrotic walls of the cysts, and in the bronchial mucosa and submucosa, but beneath this and in the sinuses of the lymph nodes at the hilum.] C. L.

MILLER (Edwin Lynn). Studies on North American Cercariae.—*Illinois Biol. Monog.* 1936. Vol. 14. No. 2. 125 pp. With 108 figs. on 8 plates. [107 refs.]

GIOVANNOLA (Arnaldo). Inversion in the Periodicity of Emission of Cercariae from their Snail Hosts by Reversal of Light and Darkness.—*Jl. Parasitology.* 1936. June. Vol. 22. No. 3. pp. 292-295. With 3 figs.

CAMPBELL (Horace E.), WEBSTER (John L. A.) & LI (S. Y.). **Human Sparganosis in the Foochow Area.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 423-433. With 4 figs. on 1 plate. [18 refs.]

A summary of the subject and a report of 5 new cases, 2 of orbital infection.

"In four cases the history of the application of a freshly killed frog was obtained. The known antiseptic power of spargana suggests its use as a rational therapeutic agent. The custom of applying split and swallowing live frogs is common in the Foochow area. Bizarre lesions should prompt the medical attendant to inquire as to the application of a frog to the diseased site." C. I..

THOMPSON (J. E.). **Some Observations on the European Broad Fish Tapeworm *Diphyllobothrium latum*.**—*Jl. Amer. Vet. Med. Assoc.* 1936. July. Vol. 89. No. 1. pp. 77-86. With 4 figs.

The paper deals with infection with the broad tapeworm of fish in Lake Skagawa, Ely, Minnesota, and of man on its shores.

After summarizing the work in the region of the Great Lakes and the anatomy [it is not the ovary which gives a brown spot to the segment of *D. latum*] and life history of the worm, it is pointed out that in 1927 every 4 to 5 pound northern pike taken there would be infected and probably have in it 20 to 40 plerocercoids; now the number of these in a fish would be only one or two. But Shagawa Lake still gets many ova from the sewage of Ely City. In 1926 an Imhoff tank was set up to deal with this sewage. Its effluent was tested by collecting in small quantities a gallon of effluent daily for 20 days; every day an oncosphere was found in 2 daily portions of a litre of this. The tank does not hold back all these eggs and thousands are passing into the lake every day. And the question is asked whether if these faeces were dropped by natural man where he pleased about the country the hazards of topography and the elements would bring it about that fewer would enter the Lake than do so when man has gone to the trouble and expense of sewage disposal. It is pointed out that storm and household drainage run into the same sewers.

"Sanitary engineers have felt for some time that more thorough sewage treatment is needed. They base their opinions as to the efficiency of a sewage plant on the physical, chemical and bacteriological nature of the effluent. Let us hope parasite control will likewise be considered."

The infections in man were almost all among Finns who eat brine-pickled fish or among those who had access to this delicacy. C. L.

BERBERIAN (D. A.). **Some Observations on the Effect of Digestive Juices on Scolices of *Echinococcus granulosus* (Batsch).**—*Jl. Helminthology*. 1936. Mar. Vol. 14. No. 1. pp. 21–40. With 4 figs. on 1 plate. [32 refs.]

It is suggested that digestive juices play an important part in determining immunity to parasites which at any period of their life cycle make use of the alimentary canal.

In vivo and *in vitro* experiments were put through. Gastric juice of dogs, cats, sheep and cattle did not digest scolices; that of rabbits acts slowly, and of man is incomplete. Intestinal juices of man, rats, rabbits, sheep and cattle digest scolices completely, that of dogs and cats is inactive, but kittens are slightly susceptible to infection. So long as a scolex was contracted it underwent little or no digestion. The conclusion is that animals whose gastric and intestinal juices are capable of the digestion of scolices are safe from infection, the others are not.

[The assumption is that these digestive juices have an action on the scolex while this is still living. The other explanation is that they have such an action only when it is dead, and that the death may be due to the presence or indeed absence of substances or conditions not directly associated with the activity of these juices.] C. L.

GENTILE (Gaetano). **Recherches expérimentales sur le "*Taenia echinococcus*."** [**Research on *Taenia echinococcus*.**]—*Boll. Sezione Ital. Soc. Internaz. di Microbiologia*. Milan. 1936. May. Vol. 8. No. 5. pp. 106–111.

——. **Ricerche sperimentali sulla "*Taenia echinococcus*."**—*Boll. Istituto Sieroterap. Milanese*. 1936. Aug. Vol. 15. No. 8. pp. 508–514. German summary.

MONIFZ' statement that it is the gastric juice which dissolves the shell of the echinococcus ovum and sets free the embryo, and the hypothesis of MARTIN that an alkaline environment is the active agent, are not confirmed by the author in the experiments here described. He first placed in a well-slide the eggs with a drop of pure acetic acid, and in another a drop of ammonia. In a few minutes the shell ruptured and the vitelline substance between it and the embryophore was dispersed over the field, but the embryophore with the embryo remained intact. Even after a longer period up to several days no further change was observed. When a similar experiment was made, substituting xylol for the acid or alkali, the vitelline substance became homogeneous and clear, no longer retaining the normal granular appearance; but the shell was not ruptured and the embryophore and embryo seemed to be unchanged.

The author next carried out analogous observations with gastric juice obtained by a gastric sound from a patient with duodenal ulcer; with bile from a patient operated upon for drainage of the gall-bladder; and with duodenal secretion by duodenal sound. In all cases the shell was destroyed, the vitelline substance became scanty, and the embryo granular. In controls with physiological saline, the shell was not affected, but the embryo gradually assumed a granular appearance similar to that in contact with the secretions. The author is of opinion that these take no actual part in nature in setting free the embryos, the liberation being due to a biological process originating in the embryo itself when it has reached the requisite degree of maturity. H. H. S.

PUTZU (F.). L'echinococcosi in Italia. [**Hydatid Disease in Italy.**]—*Riforma Med.* 1936. May 16. Vol. 52. No. 20. pp. 672-676. [2 pages of refs.]

This article has considerable value for purposes of reference, though the actual number of cases analysed is not great. The author has studied the situation in the body of the cysts in 391 cases. The liver, as would be expected, comes first with 210 or 53·7 per cent. ; the pleura is next, but a long way behind, with 65 or 16·6 per cent. and the spleen third with 17 (4·3 per cent.), though the muscles and connective tissues together give 7·6 per cent. He gives a table comparing his percentage findings with those of MADELUNG, PEIPER, NEISSER and DÉVÉ from which it will be seen that though the order is the same, the actual proportions differ considerably. The paper has a full and useful list of references.
H. H. S.

SABADINI (L.). **Les kystes hydatiques de la rate.**

This book was reviewed in Vol. 33, p. 814.

CHOURAQUI (Roger). Les procédés de destruction des kystes hydatiques dans un but prophylactique. [**Destruction of Hydatid Cysts with a View to Prophylaxis of the Disease.**] [Thesis presented to the Faculty of Medicine, Algiers.]—90 pp. With 4 figs. [Bibliography.] 1935. Algiers: Imprimerie F. Michaud.

The subject of the title is considered in seven pages at the end.

After nine dedications and a world wide historical survey the writer concludes that in Algeria not enough is being done to prevent hydatid infection and that since the worm is undismayed by sea water or sewage, it, as it lies in the viscera, must be boiled in potassium carbonate solution. [As there has to be a fire, why not burn these ?] C. L.

BOLOGNESI (Giuseppe). Rottura spontanea di una ciste idatidea epatica nel duodeno. Lezione clinica e ricordi di patologia.—*Riforma Med.* 1936. July 11. Vol. 52. No. 28. pp. 951-957. With 2 figs [19 refs.]

SEN (Satya Charan). **Development of Adult Taenia Echinococci in a Hydatid Cyst in the Muscle of a Sheep.**—*Calcutta Med. Jl.* 1936. July. Vol. 31. No. 1. pp. 38-40.

This curious report from the Department of Physiology, Medical College, Calcutta, is confirmed by the Demonstrator of Biology and the Professor of Pathology and Bacteriology of the College, and by the Health Officer of Calcutta.

The author's account is "A beautiful adult taenia . . . a small tapeworm, bottleshaped and made up of a head, a neck, and three segments. The head was provided with suckers and a rostellum armed with hooklets. The suckers and hooklets overlapped and it was possible to count only 2 suckers and 6 hooklets." Professor DE "agreed that this was an undoubted adult taenia." The Health Officer wrote, "The sample is a small taenia having 3 or 4 segments which could not be well differentiated. There were a number of hooklets which could not be counted. No suckers could be noticed." [If any specimen is still available one of the skilled helminthologists

at the Tropical School, Calcutta, would be able to say whether this unexpected object was really an adult with its double row of 28 to 50 hooks, of distinctive shape.] C. L.

COUTELEN (F.). Contrôle expérimental de certaines hypothèses récentes relatives au cycle évolutif du ténia échinocoque et à la prophylaxie de l'échinococcose. [The Evolutionary Cycle of *T. echinococcus*.]—*Rev. Méd. et Hyg. Trop.* 1936. May-June. Vol. 28. No. 3. pp. 161-178. [19 refs.]

Coutelen's conclusion is that, in spite of some recent work, the normal hosts of the echinococcus worm are dog for definitive and sheep, cattle, pigs and horse for larval hosts. There may be other, abnormal, hosts. In chickens, pigeons and turkeys infective hydatids were not formed. Re-encapsulation takes place in the livers of certain white mice after the injection of hydatid sand into the peritoneal cavity.

C. L.

BARNETT (Louis). Hydatid Disease in New Zealand. Prevalence, Prevention and Research.—*New Zealand Med. Jl.* 1936. Aug. Vol. 35. No. 188. pp. 214-220.

A record of hydatid disease in New Zealand covering 45 years.

In this period there were admitted into public hospitals in New Zealand 3,051 cases with 301 deaths, and there have been 262 deaths outside hospitals or 563 in all. The numbers of admissions of hydatids as compared with all patients was as 1 to 362 in 1915 and 1 to 823 in 1935; in 1935 it was 1 to 1,302 in N. Island and 1 to 483 in S. Island. Infection in sheep is as bad as ever; more than 80 per cent. of old sheep have it. It is estimated that in man there are in New Zealand about 125 cases a year with a death rate of 15 to 16 per cent.

C. L.

TURNER (Edward L.), DENNIS (E. W.) & KASSIS (I.). The Incidence of Hydatid Disease in Syria.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 225-228.

Hydatid infections in Beirut were 22.1 per cent. of 1,156 sheep and goats, 45.1 per cent. of 201 cattle; in Damascus were 28.5 per cent. of 1,596 sheep and goats, and all of 6 camels; in Homs 41.4 per cent. in sheep and 13.8 per cent. in goats, the total numbers being 551, and all of 5 camels; in Aleppo 27.8 per cent. of 1,126 sheep and goats and all of 4 camels. Among 14,057 patients admitted to the medical, surgical and pediatric sections of the American University Hospital, Beirut, there were 63 with infection.

C. L.

i. PENFOLD (W. J.) & PENFOLD (H. Boyd). The Diagnosis of *Taenia saginata* Infestation.—*Med. Jl. Australia.* 1936. Mar. 7. 23rd Year. Vol. 1. No. 10. pp. 317-321. With 8 figs.

ii. PENFOLD (H. Boyd). The Treatment of Patients infested with *Taenia saginata*, with Special Reference to Certain Unusual Results.—*Med. Jl. Australia.* 1936. Mar. 21. 23rd Year. Vol. 1. No. 12. pp. 385-398. With 1 fig. [23 refs.]

i. A note on the well-known methods of diagnosis of *Taenia saginata* with useful figures.

ii. Detailed instructions are given for treatment based on experience of 86 cases.

The drug of election is a reasonably fresh extract of 'male fern'. Seeing that the active principle is possibly not the oleoresin no weight is put on the particular percentage in which it should be present in the extract. The dosage should be according to the weight of the patient, these being the doses for one in hospital, with less for one who is not—7 to 9 stone 2 drachms, 9 to 10.5 stone 2.5 drachms, over 10 stone 3 drachms. They should be given in two or more portions within an hour and 2 hours after the last portion a purgative should be given, and when there has been an action the patient is discharged from hospital. There must be starvation before the drug and no more must be given for some days, though any part of the dose which has been vomited may be put back by stomach tube. There was cure in about 90 per cent. of these cases, and if no head is seen a second treatment should not be given unless segments reappear, for it may have undergone digestion or been missed. In 2 cases segments came away after anaesthesia by ethylchloride and ether and then no more were ever seen. Spontaneous cure is very rare. C. L.

PENFOLD (W. J.), PENFOLD (H. Boyd) & PHILLIPS (Mary). **Acquired Active Immunity in the Ox to *Cysticercus bovis*.**—*Med. Jl. Australia*. 1936. Mar. 28. 23rd Year. Vol. 1. No. 13. pp. 417–423. With 8 figs.

Evidence is given that the authors have in fact brought about an active immunity to *C. bovis* in oxen.

Many cattle are slaughtered in the abattoirs, and all were found free from infection. Of 88 oxen bought in the open market and fed with ova of *T. saginata* there was development of *Cysticercus bovis* in all, that is to say there is no natural immunity to this infection. The next step was the study of infections 15 days to 1 year old. No cysts were alive after 9 months, few after 7; young degenerated cysts had moist green pasty contents, in old ones these were dry, dirty yellow, hard and crumbly, and with experience their age could be roughly judged on inspection. Two oxen were drenched with 400,000 eggs each (eggs proved to be active) and a year later the dose was repeated; when killed 11 weeks later all cysticerci were of the first infection, in one there were very few, in the other many. Other tests extended the period of immunity to 79 weeks. Again, in cattle grazing on a farm fertilized by crude sewage, the percentage of infected beasts got less the longer they had grazed there, being 46 after 6 months, 33 after 15 months and 14 after 3 years. This immunity is twofold: firstly the death of cysts of the primary infection, secondly the prevention of the development of cysts from later infections. C. L.

BACARDÍ (J. Fermoselle) & DEL PINO (A. Portuondo). *Dipylidium caninum*. Caso humano. [**Human Infestation by *Dipylidium caninum*.**—*Rev. Parasit. Clin. y Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 343–347. With 2 figs. English summary (8 lines).

A segment of a cestode was brought to the author's laboratory and found to be that of *D. caninum*. The patient was a child of 16 months; she was nervous and restless, and a history was given of gastro-intestinal disturbance, frequent diarrhoea, nocturnal restlessness, "having

on various occasions tumbled out of bed." She was treated with a small teaspoonful of Kuba and the rest of the worm was passed together with a female ascaris. Subsequent examination of the faeces on two occasions revealed Ascaris ova in large numbers. An account of *D. caninum* and its life history is given and a photograph of the worm as passed in the child's stool and a photomicrograph of the gravid segment.

H. H. S.

CHICK (Eleonore). Zur multiplen Zystizerkose des Menschen.—*Muench. Med. Woch.* 1936. Apr. 24. Vol. 83. No. 17. pp. 694–696. With 2 figs. [12 refs.]

PEREIRA (C.) & VAZ (Z.). Toto-montagem de nematoides; nova e simples tecnica para montagem em balsamo. [**Mounting of Nematodes entire.**].—Reprinted from *Arquivos Inst. Biol.* 1934. Dec. Vol. 5. pp. 77–86. With 7 figs. on 3 plates. [14 refs.] English summary.

A method by which in the authors' belief good permanent preparations of nematodes may be got.

On a slide make a pool of absolute alcohol and in it put the nematode after fixing. With blotting paper remove the excess of alcohol and cover the worm with 5 per cent. celloidin solution. Float the reversed cover in 95 per cent. of alcohol for 3 minutes and, when so dehydrated, in beech-wood creosote for 20 minutes. Pick up the cover, put it down preparation side up, remove excess fluid and put on it a drop of natural, thick-flowing Canada balsam and mount on a slide. The balsam must not contain xylol or there will be shrinkage.

Directions are given for previous staining if that is desired. C.L.

BUTCHER (W. H.). Further Observations on Roundworm Infestation.—*Med. Officer.* 1936. Sept. 19. Vol. 56. No. 12. pp. 124–125.

PANISELLO (Fernando Sala), JIMENEZ (Juan A.) & GUERNICA (Antonio). Enterocolitis y apendicitis por ascariasis y tricocefalosis. [**Enterocolitis and Appendicitis associated with Ascaris and Trichuris.**].—*Archivos Med. Infantil.* 1936. July-Aug.-Sept. Vol. 5. No. 3. pp. 284–297. With 7 figs. [21 refs.] English summary.

At the Children's Hospital, Havana, the authors examined [method not stated] the faeces of 1,443 children for presence of helminth ova, particularly those of Ascaris and Trichuris. They found one or other (or both) in 603 (41·7 per cent.) and "other parasites" [not named] in another 218. They had been impressed by the number of children who were infested with these worms and who presented signs of enteritis or colitis and appendicular troubles. 3·7 per cent. had Ascaris only, 30 per cent. Trichuris only, and 8 per cent. had both. Clinical details and an account of the post-mortem findings are given of one child of 2 years who died 11 days after admission for colitis and enteritis. Trichuris were seen in considerable numbers in the mucus of the colon and an Ascaris occupied the lumen of the appendix (see illustration) p. 24, which, however, had not perforated. [There is no reference to the number of cases with helminthic infestation in which symptoms of appendicitis were present.]

H. H. S.



Caecum, adjacent colon and appendix showing the ascaris in the lumen of the last

[Reproduced from *Archivos de Medicina Infantil*]

FONSECA (Rafael Calvo). Los vermes intestinales y la apendicitis. [**Appendicitis and Intestinal Helminthiasis.**—*Rev. Parasit. Clin. y Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 471-482. English summary.

During the second half of 1935 at the Municipal Emergency Hospital of which the author is senior physician 375 operations were performed, and among the appendices removed 20 contained helminths (5.3 per cent.); among 53 children between the ages of 5 and 14 years there were 6 (11.3 per cent.). The proportion was much greater among those with symptoms of acute disease, 11 out of 61, or 18 per cent. The commonest infestation found was *Enterobius*, in 15 of the 20; *Trichuris* was found in 5, and *Ascaris* once.

H. H. S.

CH'IN (K. Y.). **Ascaris in Liver causing Fatal Hemorrhage. Report of a Case.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 119-124. With 2 figs. on 1 plate. [13 refs.]

Seemingly a unique case of death caused by haemorrhage from the liver due to mechanical tearing by an *Ascaris*.

"A pregnant Chinese woman was admitted into hospital with what she thought to be labor pain. She passed blood clots per rectum and vomited blood. Tenderness without rigidity over lower abdomen. Uterus enlarged as in full-term and in tetanic condition. Cervix dilated to 3 cm. Membranes intact and no vaginal bleeding. Caesarean section and left salpingo-oophorectomy were done with delivery of a macerated foetus. At operation free blood was found in the peritoneal cavity but the source of bleeding could not be ascertained. Patient died one day after operation. Autopsy showed that the hemorrhage was due to rupture

of the capsule overlying a subcapsular hematoma which was continuous with an intrahepatic hematoma in the right lobe of the liver. In the center of the intrahepatic hematoma, an ascaris was found. The intrahepatic bile ducts were markedly dilated and another ascaris was found inside a bile duct in the left lobe. Extrahepatic ducts also dilated. Blood clots were found in the gall-bladder and small intestines." C. L.

LEATHERS (W. S.), KELLER (A. E.) & WYMAN (B. F.). **A State-Wide Investigation of Hookworm in South Carolina.**—*Amer. J. Hyg.* 1936. May. Vol. 23. No. 3. pp. 600-614. With 3 maps & 1 graph.

The paper deals in terms of its title with 28,875 specimens of faeces, mostly from white school children.

The percentage of infection to the Stoll-Hausheer small drop method was 24.8 as compared with one of 37.3 got by the Rockefeller Sanitary Commission (1910-1914), evidently with a smear of unstated size. "This represents a decrease of 33.5 per cent. in incidence since the Rockefeller Sanitary Commission's work." The peak of 32.4 was at the age of 20-24. Infection has lessened most in the clay areas, is higher in males than females at all ages. The mean intensity (males, females and totals) was 4,200, 3,300 and 3,800 eggs per cc., and was highest at ages when the percentage of infected persons was greatest. Here again heavy infections were apt to run in families. It is noteworthy that of 595 specimens from negroes living in 6 counties only 7 per cent. were infected. [The reviewer has checked one figure only, that in Table 2 of their paper which reports a great fall in the percentage of infection as having taken place in Saluda County since 1914, one from 41.2 to 8.5. The actual infection figures up to 1914 are 77 of 1,868 or 4.12 per cent., and at present 7 of 82 or 8.5 per cent. A careful search through the Commission's Annual Reports has disclosed Saluda County once only (p. 78 of Report for 1914) with a percentage of infection of 4, so that the percentage now published based seemingly on further figures still unpublished or published elsewhere, is practically the same as the Commission's and so confirms that there is a doubled infection rate here after 22 years.] C. L.

- i. LUTRARIO (A.), ILVENTO (A.) & MAZZITELLI (M.). La diffusion actuelle de l'ankylostomiase en Italie et dans ses colonies. [Ankylostomiasis in Various Countries.]—*Bull. Office Internat. d'Hyg. Publique.* 1936. Aug. Vol. 28. No. 8. pp. 1488-1499. With 7 maps (2 folding).
- ii. CUMMING (Hugh S.). L'ankylostomiase aux États-Unis.—*Ibid.* pp. 1500-1508.
- iii. KHALEK (Khalil Abdel). La pollution du sol par les ankylostomes en Egypte.—*Ibid.* pp. 1509-1510.
- iv. RUSSELL (A. J. H.). Sur l'ankylostomiase dans l'Inde Britannique.—*Ibid.* pp. 1511-1512.
- v. TIMBAL (G.). L'ankylostomiase en Belgique.—*Ibid.* pp. 1513-1515.
- vi. MORGAN (M. T.). L'ankylostomiase en Grande-Bretagne.—pp. 1516-1517.
- vii. JITTA (N. M. Josephus). Quelques données sur l'ankylostomiase en Hollande.—*Ibid.* pp. 1518-1520.
- viii. PODIAPOLSKA. L'ankylostomiase en U.R.S.S.—*Ibid.* pp. 1521-1524. [11 refs.]

A series of reports made to the Permanent Committee of the International Office of Hygiene at its Session of May, 1936.

i. After an incomplete survey of the presence of hookworm infection outside Italy it is made clear that the distinction between carriers and sick is strongly held. It is noted that there has since 1890 been a steady spread. Thus in 1890 the infection was known in 37 provinces ; in 1912 in 14 more. When in 1933 notification was made compulsory, infection was reported from 43 communes in which it had not been known before. The basis of diagnosis—clinical or microscopical and if so by what technique—is unstated. The worm is said nearly always to be "*A. duodenalis Dubini*." No case has been reported in 20 years in the whole of Libia—suspected cases in Eritrea have proved negative and it is held decisively that there is no infection there. In Somaliland 33 per cent. of 3,250 cases were infected to the microscope. [In the absence of indication of the delicacy of the tests used these figures will not, it is hoped, be quoted as exact.]

ii. A history of hookworm work in the United States, from which the name of STILES is absent even when *Necator americanus* is mentioned and though Dubini is credited with the name of *A. duodenale*. Beside the name of Rockefeller [who set up the "Sanitary Commission for the eradication of hookworm disease" with STILES as Scientific Secretary] is put that of Ford whose cars brought about the demand for proper roads and so made investigation and supervision in hookworm work easier. It is pointed out that a theoretic degree of infection as judged by egg counts, is a very different thing in a weak child of 6 and in a strong man of 22. It is a mistake to concentrate attention on the severe case. Now that these have become very few the mild ones will get the attention they deserve.

iii. In shady places where the young and very young defaecate, 4 per cent. of soil samples contained hookworm larvae and the soil stayed infective for 6 to 8 weeks. In prevention, the measures advised are propaganda, treatment, and the installation of latrines [which seem to be bore-hole latrines]. At the village of Bahtim, 20 km. north-east of Cairo, the percentage of infection fell from 32 to 16 five years after the making these latrines. Whether the same method of diagnosis was used before and after, and whether it was a single factor experiment with no treatment given, is not stated.

iv. In Southern India infection is widespread. The percentage of infection [to unstated methods of investigation] may be as low as 20, is mostly above 75 and may be as high as 95. Soil contamination is highest in tea gardens. Bored-hole latrines to the number of 317 were made in Partabgarh "with the best results."

v. Hookworm infection has been banished, or nearly so, from the Liège coalfield. The figures of discovered infection here were 8.5 in 1904 to 1910. The percentage of positive examinations was 0.47 in 24,278 persons in 1915 and 0 in 5,764 in 1933 ; those for 1934 and 1935 were 0.029 in 3,395 and 0.032 in 6,242 in 1935. The measures taken for arrest of the disease, which had been in force since 1921, have been faecal examination of every worker in a mine, and of everyone who starts work in any mine, to be repeated 30 to 40 days later. All found infected are treated. As to latrines, those on the surface must be sufficient and convenient, those below with removeable buckets.

vi. It is only in the Cornish tin mines that the infection has been found, having been detected there in 1902. No case has been notified since 1914, though workmen's compensation would be paid to any infected person. Sanitary regulations have brought about the stopping

of defaecation in abandoned galleries; this and the flooding and pumping out of the mines has brought about the disappearance of the disease, while baths and drying of clothing are of help in prevention.

vii. Infection was noted in brick fields of Limburg in 1876 and in coal mines later. From 1906 miners were examined, surface latrines and lavatories set up, and buckets provided for latrines underground. The greatest number of men found infected was 83 of 11,000 in 1917. In 1925 legal ordinances were withdrawn but the mine authorities continued to keep watch. Thus in 1930 two carriers of worms or their larvae were found in immigrants in 4,997 specimens. The ventilation of the mines is good, they are not damp and their temperature is not high. [The mention twice of larvae in stools raises, of course, the question of *Strongyloides* unless the stools were old. Whether the same method of examination was always used and what it was are unstated.]

viii. In Russia the infection was known before the revolution only in those who pierced the Sourame tunnel on the Trans-Caucasian railway. It is widespread in Azerbaijan, particularly at Lenkoran on the Persian frontier, and in the west of Georgia but is absent in Armenia. Most infections are with *Necator*. The incidence is patchy, lies between 59 and 80 per cent. in natives and is only 8 in others. Collection of worms from 708 cases has shown recovery generally of 10 or less, in none were over 500 found. Infection is almost completely absent in the well regulated mines of Tkvarchel though there is a 68 per cent. infection on the surface. The techniques of examination are not mentioned.

C. L.

MAZZITELLI (M.). Il tetracoloruro di carbonio considerato come attivatore diagnostico dei portatori di anchilostoma. [**Carbon Tetrachloride as Activator for Diagnosis of Hookworm Carriers.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. June. Vol. 17. No. 6. pp. 334–341. [13 refs.]

Infestation by hookworms, the author states, is more widespread among those living in the Avenza plains than is generally believed. The number of persons whose faeces were examined [? direct smear] was small, only 60, their ages ranging between 3 and 6 years. At the first examination 17 specimens were found to contain the ova, 43 were negative. He then administered carbon tetrachloride in the following doses: to adults 3 capsules, containing each 1.2 cc.; to those between 10 and 18 years 5 capsules, each of 0.6 cc., to those under 10 years, 3 capsules each of 0.6 cc. Further examination of the stools was made and this time 29 were positive, among them 12 of those who had before shown no ova.

H. H. S.

BERNY (P.). Tuberculose et ankylostomiase. [**Tuberculosis and Hookworm Infestation.**]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 471–474.

Of 30 tuberculous cases 11 had hookworm eggs to Willis' technique (37 per cent.) while in 2,884 routine cases examined at the Cayenne Institute of Hygiene the percentage was 52.

C. L.

PEÑA CHAVARRÍA (A.) & ROTTER (Werner). Estudios hematológicos y anatomopatológicos sobre la anemia anquilostomíatica. [**Haematological and Pathological Studies on Hookworm Anaemia.**]—*Bol. Ministerio de Sanidad y Asistencia Social*. Caracas. 1936. June. 1st Year. Vol. 1. No. 4. pp. 311-326. [20 refs.]

[The subject matter of this paper is dealt with at length in the special article by Colonel Clayton LANE (see above, p. 1) hence there is no need for detailed abstract here.] Investigation of the blood condition of 80 cases of ankylostomiasis and of 96 autopsies of patients dying of hookworm anaemia in the Hospital de San Juan de Dios has led the authors to the following conclusions:

1. The reticulocyte curve is the best gauge of reaction on the part of the haemopoietic organs.

2. This indicates that expulsion of worms *plus* administration of iron is the greatest stimulus to blood regeneration, whereas 12 days of anthelmintic treatment alone produced no reticulocyte response.

3. Those districts furnishing most cases of severe hookworm anaemia are those where least meat is eaten per head.

4. Hookworm anaemia is an *anaemia ferripriva* not due to diet alone, because cases of anaemia of alimentary origin in the district do not show deficiency of iron in the tissues.

5. In cases of intense anaemia the marrow of the long bones shows signs of considerable aplasia, even in children below the age of 15 years.

6. Hookworm anaemia may cause thrombosis and embolism with the characters of a progressive thrombopathy. Of the 96 autopsies referred to, in 61 per cent. there was a thrombosis, whereas in another 1,764 it was found in 16 per cent. only.

7. This tendency to thrombosis is to be sought in the blood changes, in the slow circulation from fatty myocarditis, and the "hydropic constitution" from dietetic deficiency.

H. H. S.

CRUZ (W. O.). Sobre o mecanismo de formação das hyperglobulias de origem toxica. [**On the Production of Excess of Erythrocytes by Toxins.**]—*Mem. Inst. Oswaldo Cruz*. 1936. Vol. 31. No. 2. pp. 349-355. With 1 graph. English summary.

Toxins may produce rise in red blood corpuscles and in haemoglobin by contraction of the spleen.

As seen in Table I, two cases were given 5 treatments with oil of chenopodium, and the haemoglobin rose after about 4 months from 30 to 53 in one case, and from 23 to 53 after about 7 months in the other. In Table II are seen the effects of chloroform in a person who had also had 10 cc. of a 40 per cent. solution of chloretone in alcohol; the red cells increased from 5 to 6.2 million per cmm. and the haemoglobin rose from 75 to 86 after one day, falling to 80 after 2 days, at which time he died. A third Table shows that in a woman whose spleen had been taken out there was no such rise. On these facts, it seems, it is concluded that the rise in erythrocytes and haemoglobin has a toxic cause in both sets of experiments and that the principal factor lies in a spleen contraction, probably induced by a hypotension which was observed, a contraction which brings forth "a launching into the circulatory torrent of concentrated blood (splenic slime), normally kept in reserve in the spleen."

C. L.

JOLLY (A.). L'anémie pernicieuse progressive et la cachexie aqueuse dans l'uncinariose. Considérations générales et aspect clinique. [**Hookworm Anaemia and Oedema.**].—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 785-798.

Details are given of 9 cases of severe anaemia from hookworm infection held to be clinically identical with the type described under the name of Biermer's anaemia, that is to say of Addisonian pernicious anaemia.

In comment this has to be said. Addisonian pernicious anaemia is a megaloblastic hyperchromic anaemia. In none of these cases is the size of the red cells noted, in one only is the percentage of haemoglobin given. The cases are of the sort familiar to those whose reading has included the early reports of the Rockefeller Commission. They had grave anaemia, oedema and serous effusions and improved with unworming. The old observation that absence of eosinophilia is a grave sign is reaffirmed. C. L.

FOSTER (A. O.). **On a Probable Relationship between Anemia and Susceptibility to Hookworm Infection.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 109-128. With 2 graphs. [14 refs.]

Susceptibility to hookworm infection in dogs and cats was, it is claimed, made greater by periodic bleeding and by a milk (iron deficient) diet. The findings "are interpreted as indicating a probable [inverse?] correlation between anaemia and resistance to hookworm infection."

Experiments put through in 1932-33 are now made public. They are of two sorts, periodic blood loss and a milk diet, but in Foster's belief iron deficiency is probably at the back of both series of experiments. In general, infective larvae of *A. caninum* were given by mouth it is gathered; bleeding was by puncture of the heart; the milk diet was made up of these percentages: whole milk powder 72.3, cane sugar 18.7, calcium carbonate 9.0; it had an iron percentage of about 0.000225, and all animals (except 2 pups used for infection with *Necator americanus*) died while taking it.

As to bleeding, details are given in a table of 3 of the 4 dogs which did not die from these. Up to day 368, they were given different quantities of larvae and the bleedings were at different intervals over different periods of time. Bleedings then stopped and thereafter the dogs had the same doses of larvae on the same days. As compared with day 368 there took place on day 424 (or 417) these changes in haemoglobin percentage and eggs passed per day (in thousands): Dog 730 a rise from 28 to 60 and from 299 to 3,149; Dog 752 a rise from 32 to 68 and a fall from 506 to 253; Dog 755 a rise from 38 to 56 and a fall from 175 to 97.

As to diet, 3 dogs which had by repeated infection with *A. caninum* become very resistant were put on the milk diet, and the periodic giving of larvae was continued. In these conditions the egg output was not materially changed, but they lost about half their body weight. To 2 pups on the milk diet 4,000 infective larvae were given half by mouth and half by skin, and in their intestines were seen on autopsy 5 and 31 worms "with no indication of sexual maturity, however, although the worms were otherwise mature"; this being, it is believed, the first report on *N. americanus* to this stage in the dog. As to 5 cats,

infected with the cat strain of *A. caninum*, there was in 2 an increase in the daily output of eggs at or within a week of death, while in 3 there was not. The number of larvae given at one time varied from 125 to 30,000 and the intervals between infections from 2 to 117 days. One, C. 533, had been on a normal diet for 432 days, and by then had been given 10,115 larvae and was passing 13,000 eggs a day; it was then put on the milk diet and had given it, in 3 doses, 17,200 more larvae, but, in spite of this, 56 days later eggs could be found only by D.C.F., whereon a dose of 30,000 larvae produced 19, 26 and 30 days later 6,000, 15,000 and 6,000 eggs a day, death taking place on the last of these days. [These very variable results hardly merit the drawing of general conclusions.] C. L.

QUENARDEL. Observations sur le traitement de l'ankylostomiase.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Apr. Vol. 14. No. 4. pp. 388-394.

DE GIORGI (Mario). Della profilassi della anchilostomiasi con la calciocianamide. (Contributo sperimentale.) [**Calcium Cyanamide in Hookworm Prophylaxis.**—*Giorn. Ital. di Malat. Esot. e Trop.* 1936. Aug. 31. Vol. 9. No. 8. pp. 172, 175.]

A confirmation of the observation of STÉVENEL and BERNY that cyanamide of calcium in a strength of 1 in 3,000 kills hookworm larvae and prevents development of the eggs. C. L.

VAN DER BERGHE (Louis). On the Occurrence of a Species of *Ancylostoma* closely related to *A. duodenale* in an African Lemur.—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 224-226. With 1 fig.

An ancylostome is described from 2 male specimens got from the lemur, *Galago crassicaudatus*, akin to *A. duodenale* is given subspecific rank under the name *A. duodenale galagoi*.

It is separated from *A. duodenale*, because the host is purely arboreal, because in the area *A. duodenale* is unknown to man, because the general measurements were small, because the "third or posterior pair of teeth" are slightly larger than in *A. duodenale* and the spicules are shorter (1.4 mm.). [There are those who will hold that in fact a fresh and non-optimum host of *A. duodenale* is here added to the list, because in such hosts *A. duodenale* is as already known apt to be dwarfed, that it is not possible to prove a universal negative for human infection in the area even if intensive work had been done on the matter, and that the drawing suggests a flattened specimen with teeth seen from an unusual angle and so with an unusual outline. If these lemurs never reach the ground it seems that for infection to occur in them their use of a tree branch as a drop latrine must be as careless as that of some of their human cousins.] C. L.

NOLASCO (J. O.) & AFRICA (Candido M.). A Fatal Case of Paralytic Ileus associated with Severe Strongyloides Infestation suggesting Internal Autoinfection.—*Jl. Philippine Islands' Med. Assoc.* 1936. May. Vol. 16. No. 5. pp. 275-283. With 6 figs.

[The suggestion in the title seems well based.]

A leper with heavy strongyloides infection died with abdominal pain and distension, and vomiting. The whole intestine from duodenum to ileocaecal junction was distended and its wall thickened.

There was no organic obstruction. The caecum showed small polypoid growths.

"Histological examination of the jejunum, ileum, large intestine, and appendix showed filariform larvae in the mucosa, submucosa, muscularis, and subserosa. The number of parasites counted and found in only one histological section varied from 8 to 21. In the section of the large intestine where 21 parasites were found, 7 were in the mucosa, 3 in the submucosa, 2 in the muscularis, and 9 in the subserosa. Where there were fewer parasites, a similar distribution was found in the different layers of the other portions of the intestinal wall. In the large intestine the small polypoid growths were found to be due to small, organizing, submucous abscesses in connection with the base of dilated glands of Lieberkühn. Some of these glands showed small cystic dilatations. Pseudo-tubercles, which were also found in all the sections, in the submucous, muscular, and subserous coats, were especially pronounced in the subserous layers. Many of the pseudo-tubercles were in definite relation with what appeared to be dead larvae in process of disintegration. In the meso-appendix clear-cut sections of the actively invading, living larvae without any cellular accumulation around them were found after examination of several serial sections. In fig. 5 is shown a filariform larva, also in the meso-appendix, with a few epithelioid cells and a giant cell around it. In the liver larvae of a few parasites were found, some of them surrounded by pseudo-tubercles."

C. L.

FAUST (Ernest Carroll). *Strongyloides* and *Strongyloidiasis*.—*Rev. Parasit., Clin. v. Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 315-341. With 1 fig. [47 refs.]

MATOFF (Konstantin). Beobachtungen ueber die larvale Entwicklung von *Strongyloides papillosus* (Wedl, 1856) und Infektionsversuche mit filariformen Larven.—*Ztschr. f. Parasitenk.* 1936. Apr. 18. Vol. 8. No. 4. pp. 474-491. With 8 figs. [15 refs.]

BLUMER (George). **Trichinosis, with Special Reference to Changed Conceptions of the Pathology and their Bearing on the Symptomatology.**—*New England Jl. of Med.* 1936. June 18. Vol. 214. No. 25. pp. 1229-1235. [19 refs.]

The infection is a septicaemia and the embryos are carried to organs in which encystment does not take place.

It is not an infection of the skeletal muscles only. Note is made of 3 groups of unusual cases, with case histories in illustration; those in which there is prominence of heart symptoms from myocardiac damage, of nervous symptoms with lesions in the central nervous system, and of evidence of renal damage. For treatment there is no specific substance and if there were Blumer is doubtful whether its use would be wise in view of the large numbers of larvae often present and the results of flooding the body with their death products. For prevention, meat inspection is of no use, for as STILES pointed out many years since, of 6,329 cases with 318 deaths which took place in Germany 2,402 cases and 112 deaths were in those who had taken food which had been let through to the trade as free from trichinae after inspection. Prosecutions of meat dealers are not then right. Food must be properly cooked.

C. L.

MERRITT (H. Houston) & ROSENBAUM (Milton). **Involvement of the Nervous System in Trichiniasis.**—*Jl. Amer. Med. Assoc.* 1936. May 9. Vol. 106. No. 19. pp. 1646-1649. [33 refs.]

Details of 2 cases of involvement of the nervous system in trichinosis are given as well as a survey of the literature.

The main comments made are these. For diagnosis, a history of the taking of pork, eosinophilia often late, antigen skin tests and muscle biopsy positive, a normal cerebrospinal fluid, no widespread subcutaneous oedema. Prognosis in those with only muscular weakness or no reflexes is very good, recovery being complete or nearly so; in those with mental symptoms or signs of focal lesions in the central nervous system much more serious, death taking place in 46 per cent. of the reported cases. C. L.

*TRAWINSKI (A.). Studien ueber Immunität bei Trichinose. [**Immunity to Trichinella Infestation.**]—*Zent. f. Bakt.* I. Abt. Orig. 1935. June 14. Vol. 134. No. 3-4. pp. 145-149.

It was established that the lethal dose of trichinae for white rats, particularly susceptible animals, was about 200 of these, for with this dose about 90 per cent. of them died in 10 to 15 days after the administration of the infective material. When infective muscle is washed, pulverized, and suspended in normal saline no serum can be got which is active in immunizing rabbits. On the other hand a serum taken from heavily infected rabbits between the 25th and 35th days is very active for infected rats. Rats given 3 times the lethal dose or more of muscle trichinae withstand the infection well, and live, provided they are given subcutaneously three 1 cc. doses of this serum, which is antitoxic, not antiparasitic. C. L.

ROTH (Hans). Ueber das Vorkommen pränataler Trichinenuebertragung bei künstlich infizierten Meerschweinchen. [**Experimental Infestation of Guineapigs in utero with Trichinella.**]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Apr. 30. Vol. 136. No. 5-6. pp. 278-284. [16 refs.]

Prenatal trichinosis has been caused experimentally in guineapigs.

Ten mothers were infected and bore 22 young; 9 of these were infected and when their bodies were digested in acid pepsin solution there was recovery of 1, 2, 4, 13 to 19, and 126 measles. C. L.

GALLIARD (Henri). La filariose à *Wuchereria bancrofti* dans la région da Hanoi (Tonkin). [***W. bancrofti* Infestation in Hanoi (Tonking).**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. May. Vol. 14. No. 5. pp. 439-441.

In 200 persons not suffering from signs of filariasis and examined between 11 p.m. and midnight microfilariae were found in thick drop preparations 12 times, and it is noted that there is no need to examine more than 2 preparations. MATHIS and LEGER in 1911 found an infection rate of 9 in 300 prisoners at Hanoi. Periodicity is marked, for in 180 sick examined in hospital at 10 a.m. microfilariae were numerous twice only. There is no parallelism between physical signs and the

* This fuller summary should be read in place of that in Vol. 33, p. 124.

numbers of microfilariae in the blood ; thus in 2 cases only were there as many as 60 of these to the drop, in them there were no clinical signs of infection, and in those who have such signs there were very few microfilariae. Eosinophilia when present may have been caused by intestinal worms and was not constant in those with physical signs. Transmission was by *Culex fatigans* and *Anopheles hyrcanus* while attempts with *Armigeres oblongatus*, *Aedes argenteus* and *A. albopictus* were failures.

C. L.

SUNDAR RAO (S.). **Filariasis in Patnagarh (Orissa Feudatory State).**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 871-879. With 1 map.

" 1. Patnagarh in Orissa, a small rural type of town, has endemic filariasis ; the infection consists entirely of '*Filaria*' *malayi* Brug. The gross infection rate is 17·8 per cent. and the filarial disease rate is 3·3 per cent. The types of filarial diseases are either filarial lymphangitis or elephantiasis of the limbs. Elephantiasis of the legs is the most common filarial affection. Elephantiasis of the genitals, hydrocele and chyluria are entirely absent.

" 2. Transmission of the infection is primarily through the agency of *Mansonioides annulifera* which is the commonest species of mosquito in Patnagarh. The species showed an infection rate of 20·9 per cent. under natural conditions. *M. uniformis* plays a secondary part in transmission. Species of *Culex* and *Anopheles* do not appear to be concerned with the transmission. The breeding places of *mansonioides* are the large tanks densely covered with *Pistia* which occur in the area surrounding the town."

C. L.

ABE (Shinichi). **Some Results on Blood-Examination for searching the Existence of *Microfilaria Malayi* in Japan.**—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1936. Mar. Vol. 35. No. 3 (372). [In Japanese pp. 689-696. [23 refs.] English summary p. 697.]

Microfilaria malayi was not found in blood examinations of 915 soldiers from districts south of Tokio, though *Mf. bancrofti* was seen in 78 of them.

C. L.

KEIL (Ernst). Zur Behandlung des Filariaanfalles mit Prontosil. [Filariasis treated with Prontosil.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 400-405. [13 refs.]

In 9 lepers prontosil had no effect on the numbers of *Mf. bancrofti* in the blood.

C. L.

O'CONNOR (Francis W.) & BEATTY (Harry). **The Early Migrations of *Wuchereria bancrofti* in *Culex fatigans*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. June 30. Vol. 30. No. 1. pp. 125-127. With 2 figs. on 1 plate.

The authors' summary is as follows :—

" 1. Within 45 minutes after *Culex fatigans* feeds on a person whose blood contains *Microfilaria bancrofti*, exsheathed larvae are seen outside the stomach, having apparently passed through the undamaged wall of the viscus to enter the abdominal cavity.

" 2. In St. Croix within 2 hours after such a feed newly arrived larvae are found in the thorax of the insect.

" 3. Between 10 and 18 hours, possibly longer or shorter according to climatic conditions, larvae mass in large numbers and are found to be very active in the anterior part of the midgut of the insect. Reversed peristalsis of the viscus may or may not play a part in the movements of the parasites along this structure.

" 4. The penetration by the parasites through the walls of the midgut to the exterior has been observed.

" 5. Thus exsheathed *W. bancrofti* larvae from the stomach of *Culex fatigans* may reach the thorax by the abdominal route or later, and probably in larger numbers, by the route of the anterior midgut.

" 6. By modifying well known methods of dissection and staining, a technique has been devised whereby permanent preparations may be made which illustrate some of the foregoing facts." C. L.

MENON (K. P.) & SEETHARAMA IYER (P. V.). **The Viability of the 'Infective' Forms of the Larvae of *Wuchereria bancrofti* when Freed from the Mosquito Host.**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 881-883.

Since infective larvae freed from naturally infected *Culex fatigans* can live in tap water from $4\frac{1}{2}$ to $6\frac{1}{2}$ hours, it seems that if they can get free in nature infection might take place (as MANSON originally suggested) from drinking water, particularly as they can live in 0.2 per cent. hydrochloric acid for 20 to 45 minutes if it is mixed with 10 per cent. egg albumin. In the unadulterated acid of this strength they do not live beyond 12 minutes. C. L.

FENG (Lan-Chou). **The Development of *Microfilaria malayi* in *A. hyrcanus* var. *sinensis* Wied.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 345-367. With 2 charts, 1 fig. & 4 plates. [20 refs.]

The study was put through at a room temperature of 29°-32°C. Microfilariae begin to leave the "stomach" of the mosquito in 3 hours and migration is complete in 10 hours. There is no mention of any collection of them in the anterior tubular part of the midgut. If the sheath is not fully got rid of, an undeveloped monster larva is passed. In the body of the mosquito active migration takes place to all parts, and two more moults take place in it, the tail of the microfilaria with its two nuclei being shed with the first moult. The changes in shape and structure are noted and measured.

" The buccal cavity is formed from the cephalic space of the microfilaria, the oesophagus from the nuclei of the anterior part of the nuclear column, the mid-intestine from the nuclei of the middle part of the nuclear column corresponding to the position of the Innen-körper, and the rectum and the anus are developed from the four G cells of Rodenwaldt and the anal pore. The Genitalanlage of Looss or the premature genital mass is probably derived from some nuclei at the neighbourhood of the Innen-körper, and not from any of the G cells as stated by previous workers. The structures found at the sides of the anterior part of the oesophagus near the buccal cavity and those at the posterior part of the rectum near the anus of the mature larva are probably developed respectively from the Mund- and Schwanzgebilde. The muscles of the body wall of the mature larvae are formed from the so-called "subcuticular cells" of Rodenwaldt. The nerve ring and the excretory pore correspond to the same structures of the mature larva." C. L.

AUGUSTINE (Donald L.), FIELD (Madeleine E.) & DRINKER (Cecil K.). **Observations on Living *Microfilaria immitis* in the Capillary Circulation of Bats.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 231-232.

These observations make clear how it is that microfilariae are not necessarily causes of capillary emboli.

They were made on the uninjured wing membrane of small brown bats weighing about 6 grams. After anaesthetization by intraperitoneal injection of nembutal, a concentrated suspension of *Mf. immitis* in 0.3 cc. of normal salt solution was given into a vein. Microfilariae were seen at once in capillaries. Within them active migration was conspicuous. Even in the arterioles their movements may be against the blood stream, the microfilariae "making slow progress by bracing themselves through the crests of the alternate undulations of their bodies against the walls of the vessel." When they came to a capillary too small for them "they never were observed to escape or make permanent plugs. They simply backed out." These observations were put through on normal capillaries so are valid proof of what takes place with unsheathed larvae in normal conditions. [It is to be hoped that these workers will have the opportunity to repeat these experiments with the sheathed *Mf. bancrofti*.] C. L.

LINDBERG (K.). **Draconculose en Iran. [Prevalence of Dracunculosis in Iran.]**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Aug. Vol. 40. No. 8. pp. 330-342. With 5 figs. [31 refs.]

Lindberg estimates that the population of Lai is 8,000 to 13,000 and that 1,000 to 5,000 persons suffer yearly from dracunculosis.

The endemic area seems to take up about the lower half of the north-east coast of the Persian Gulf. He believes that *Mesocyclops iranicus* n. sp. is the larval host, but has never seen infection in it, and has seemingly not tried to infect it himself. C. L.

MOORTHY (V. N.) & SWEET (W. C.). **A Note on the Experimental Infection of Dogs with Dracontiasis.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 437-442. With 8 figs.

Male and female worms were found in the tissues of dogs to which had been fed infected cyclops or embryos got from them.

The investigation is in two parts. A dog from a non-endemic region was fed repeatedly in an endemic area during May, 1935, with a total of 123 infected cyclops and fully developed larvae released from 40 more. The cyclops had themselves been infected by larvae got from man by spraying newly opened guineaworm blisters with ethyl chloride. The dog's highest eosinophil count before the infective feed was 19.3 per cent., and after it 35 per cent., in August; and that month digestive troubles and pustular eruptions were present. On 20th April, 1936, 350 days after the first and 331 days after the last infective feed the dog was restless, off its food, with a rectal temperature of 104°F. with a pea-sized blister above the paw of the left hind foot. When opened and sprayed with ethyl chloride embryos came away. Other worms showed themselves as follows:—April 27th in left front foot, April 29th proximal third of right thigh, April 29th left side of scrotum. Two more tumours were present on the left thigh and chest. The larvae obtained from the worms in the dog were many fewer than

from man but they and the worms could not be distinguished from those got from man. A control dog had no infection.

A series of 28 pups was fed on infected cyclops or had the embryos injected subcutaneously. One to 4 months after the first infective feed all pups became ill with digestive disturbances and pustular skin eruptions; 24 of them died in 2 to 5 months, usually with nervous symptoms or in convulsions, but since 1 of the 2 controls died in the same way the connexion of these symptoms with the infection is at present held doubtful. Autopsies were done on all 28, but only on the last 4 was anything significant found (see table) it being felt on looking back that these negative results may well have been due to lack of knowledge as to where and how to search.

Nematode worms found post-mortem in four dogs previously given feedings of guinea-worm larvae.

	Dog No. 19	Dog No. 20	Dog No. 21	Dog No. 28
Number of female worms ...	1	74	18	44
Number of male worms ...	5	17	7	7
Where found ...	Retro-oesophageal; beneath right scapula.	Right orbit; meninges; retro-oesophageal, thorax; abdominal wall, peritoneal cavity, extremities	Scalp, retro-oesophageal; thoracic wall, abdominal wall, extremities	Retro-oesophageal; thoracic wall, extremities
Total number of infected cyclops and fully-developed embryos fed to dog	150	140	132	88
Number of days between last infective feed and death ...	105	115	144	67
Age at time of infection ...	1½ months	3 months	2½ months	2 months

The worms found were of either sex; in the first 3 dogs the females were 7 to 49 cm. long, the males had a maximum breadth of 2.4 cm. with a breadth of 0.7 mm. In the fourth dog, the worms, obviously immature, were at the most 2.4 cm. long.

The descriptions are not easy to follow but the worms had a definite head with, it seems, a pair of large lateral papillae and a pair of sub-ventral and of subdorsal papillae on the head, and a pair of cervical papillae. The tail of the male is curved in a spiral. Of the two spicules it is said "the left ventral spicule averages, in 3 specimens, 0.55 mm. in length, and the right dorsal 0.53 mm. [The micro-photograph suggests to the reviewer a short stout spicule running forward to half way round the first coil and a long thin one running forward to about half way round the second, when the tips of both are at the cloacal opening.]

C. L.

NÁJERA ANGULO (L.). *La Onchocerca volvulus* en Fernando Poo. [*O. volvulus* in Fernando Po.]—*Primer Congr. Nac. Sanidad 1934, Actas 4.* pp. 241–293. With 13 figs. [8 pages of refs.] 1935. Madrid. [Summarized in *Rev. Applied Entom.* Ser. B. 1936. Sept. Vol. 24. Pt. 9. p. 213.]

“ From July 1929 to January 1930 the author found cysts of *Onchocerca volvulus* in 121 (19·11 per cent.) of 633 natives examined on the island of Fernando Po. In view of the probable part played by *Simulium damnosum*, Theo., as a vector of *O. volvulus* in Sierra Leone, over 100 flies of this species caught in Fernando Po were dissected, but microfilariae of *O. volvulus* were found in one only. A negative result was obtained with 25 examples of this Simuliid that were fed on natives harbouring cysts of *O. volvulus*.”

KOFOID (Charles A.) & WILLIAMS (Owen L.). *The Nematode Thelazia californiensis* as a Parasite of the Eye of Man in California.—Reprinted from *Arch. Ophthalm.* 1935. Feb. Vol. 13. pp. 176–180. With 5 figs.

The first case of infection by *Thelazia* in man in America and the first report of *Thelazia californiensis* in man.

Eight years ago a doctor felt an irritation in the right eye. When 2 per cent. butyn solution was dropped in, three actively moving worms came into sight, which proved to be a male and two female specimens of *Th. californiensis*. Measurements: male 10·26 mm. females 13·25 and 11·44 mm. long, by 0·25, 0·294 and 0·325 in greatest diameter. The anatomy is detailed and figured and so are the points which are relied on to separate *Th. californiensis* from *Th. callipaeda*. Asis pointed out, the life-history of the genus is unknown; but 10 days before irritation came on, some flying insect got into his right eye. C. L.

JOHNSTON (T. Harvey). *A Note on the Occurrence of the Nematode Gongylonema pulchrum* in Man in New Zealand.—*New Zealand Med. Jl.* 1936. June. Vol. 35. No. 187. pp. 172–176. [15 refs.]

The eighth record, it is believed, of *Gongylonema pulchrum* in man.

The worm presented on the lower lip of a young Yugoslav, who had gone back from New Zealand to Yugoslavia for a visit two years ago. It was extracted there in Auckland and sent to and identified by Professor T. Harvey JOHNSTON of Adelaide; and was a fertilized female 58 mm. long. The male has not shown itself. There is a short description of the other cases in man. C. L.

OGURA (Katsuchiyo). *Parasite Eggs and Endamoeba histolytica* retained under Finger Nails of School Children in Keijo, Chosen.—*Jl. Public Health Assoc. Japan.* 1936. July. Vol. 12. No. 7. pp. 1–4.

Examinations of the paring of dirty finger nails, 0·5 to 3 mm. long, of 300 children showed these helminth eggs: *Ascaris* 6, *trichuris* 7, *enterobius* 1, tapeworm 21, *paragonimus* 1. In one *trichuris* egg a larva had formed, and one *ascaris* egg had got as far as the morula. No parasitic protozoa were found. C. L.

PIERI (J.) & BOUET. Ictère par anguillulose rebelle. Guérison par instillations duodénales de térébenthine colloïdale.—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 513-516.

GALLIARD (Henri). Sur un cas mortel d'anguillulose observé à Hanoi.—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Mar. Vol. 14. No. 3. pp. 335-339. [10 refs.]

MAPLESTONE (P. A.) & BHADURI (V. N.). **Cholera and Intestinal Helminths.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 449-450.

Cholera has very little if any effect in ridding a person of helminth infections.

Stool samples from 100 cholera cases were examined by D.C.F. for as many days (2 to 14) as the persons were in hospital. At the start 95 cases had hookworm infection and at the finish 91. The corresponding figures for ascaris were 26 and 24, and for trichuris 27 and 24.

C. L.

BACIGALUPO (Juan). Sobre la presencia accidental de huevos de helmintos en las materias fecales humanas. Su significación clínica. Su diagnóstico.—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May-June, Vol. 2. No. 3. pp. 267-276. With 6 figs. on 1 plate. [10 refs.] English summary.

JOYEUX (Ch.) Recherches helminthologiques dans la région de Marseille.—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 413-419. English summary.

GIOVANNOLA (Arnaldo). **Energy and Food Reserves in the Development of Nematodes.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 207-218. With 8 figs & 1 diagram. [15 refs.]

"The substances stored in the nematodes have been distinguished as energy reserves and food reserves. The glycogen is found essentially in those stages that precede a rapid and intense development and has been considered as an energy reserve. The fat is found essentially in those stages that precede a period of less nutrition or of fasting, or in complete sexually developed stages and has been considered a food reserve."

C. L.

ANDREWS (John S.). **Note on the Egg Producing Capacity of *Cooperia curticei*, a Nematode Parasitic in Sheep.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 222-223.

In yet another nematode infection it is found that as the worm load increases the number of eggs posited per female worm lessens. [More evidence that the crude estimation of worm loads by egg counts has no exactitude and no scientific basis.]

C. L.

CHANDLER (Asa C.). Studies on the Nature of Immunity to Intestinal Helminths. IV. The Inter-Relations between Parenteral and Intestinal Immunity in Rats Infected with *Nippostrongylus*.—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 129-144. [13 refs.]

RADHAKRISHNA RAO (M. V.). Cirrhosis of the Liver following Chronic Intoxication with Carbon Tetrachloride: an Experimental Study.—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 1007-1014. With 8 figs. on 2 plates. [16 refs.]

CAWSTON (F. Gordon). Tartar Emetic and Sodium Antimonyltartrate.—Reprinted from *Pharmaceutical Jl.* 1935. Sept. 7. 1 p.

LEISHMANIASIS.

ARCHIBALD (Robert). **Interim Report on Kala-Azar Investigations.**—*Rep. Sudan Med. Service for Year 1935.* p. 65.

This report is a catalogue of certain results of the kala azar investigation in the Sudan. From the point of view of insect transmission the peripheral blood of 31 cases was examined for leishmania with the discovery of parasites in two of the cases. Nasal swabs from 22 cases revealed parasites in 7 cases, in two of which the infection was heavy. No parasites were found in the faeces, urine or conjunctival secretion, nor in the viscera of dogs, cats or other animals; nor in wild sandflies, lice and bed-bugs taken in kala azar huts. It is concluded that the available data strongly suggest contact infection. As regards animal experiments it is noted that grey monkeys are susceptible to subcutaneous inoculation and that leishmania may appear in the nose, as judged by nasal swabs, within 21 days after intraperitoneal inoculation. Grey monkeys have been infected by nasal swabbing and spraying with infective material. Two of five healthy monkeys contracted infection when confined in an insect-proof room with five experimentally infected monkeys. C. M. Wenyon.

MAYER (Martin) & MALAMOS (Bas.). Experimentelle Beiträge zur Leishmanioseforschung. [**Experimental Contribution to the Study of Leishmaniasis.**]—*Arch. f. Dermat. u. Syph.* 1936. Vol. 174. No. 3. pp. 225–250. With 21 figs. [29 refs.]

This paper gives an account of studies of oriental sore and kala azar in Crete, where the diseases have already been reported upon by PAPANTONAKIS (this *Bulletin*, 1936, Vol. 33, p. 17). As was noted by this observer, oriental sore occurs in the old Turkish quarter of the town where the houses are crowded into narrow streets, while kala azar in human beings and dogs is found only on the newer periphery of the town where the houses are separated from one another by open spaces. The general features of these diseases are the same as have been described from other endemic foci. Of special interest is the study of kala azar in dogs and the confirmation of the statements that have been made regarding the tendency to cutaneous ulceration and the general distribution of leishmania throughout the skin of the body, sections of perfectly healthy skin, as judged by its appearance, showing nests or collections of parasites in large numbers. As regards pathological changes in dogs there appears to be little relationship between the intensity of infection and the degree of change. The formol-gel test was carried out on the serum of over 600 dogs with a positive result in 42, of which only 33 per cent. were proved to be infected. Conversely, known infected dogs do not all give a positive reaction. A number of cases of kala azar and oriental sore, mostly recovered cases, were tested for a skin reaction by intracutaneous injection of antigens of killed flagellates from surface cultures. Of 23 oriental sore cases tested with *Leishmania tropica* antigen 18 gave a positive reaction. Of 12 of these cases tested with *L. donovani* antigen 6 were positive. Of 3 early cases of kala azar tested with both antigens not one was positive, whereas of 31 recovered cases 17 were positive with *L. donovani* antigen while of 12 of these tested with *L. tropica* antigen 7 were positive. As regards transmission of the disease it was noted that of sandflies in the

oriental sore area only *Phlebotomus sergenti* and *P. papatasi* occurred, while the recognized vectors of kala azar, *P. major* and *P. perniciosus*, were absent. The two last, however, were present in the peripheral areas of the town where kala azar occurs. For the prevention of the disease it does not seem possible to carry out measures against the sandflies. Reliance will have to be placed on early diagnosis of cases and the destruction of sick dogs, which at present continue to live in close association with their owners.

C. M. W.

PAPANDONAKIS (Evangelos). Observations sur les leishmanioses dans la Préfecture de la Canée (Ile de Crète). [**Leishmaniasis in the Prefecture of Canea, Crete.**]—*Bull. Office Internat. d'Hyg. Publique*. 1936. May. Vol. 28. No. 5. pp. 852-860. With 1 map, 3 diagrams, 1 plan & 1 plate.

A short account of kala azar and oriental sore in Canea, Crete, similar to that previously published (this *Bulletin*, 1936, Vol. 33, p. 17).

C. M. W.

GIRAUD (Paul) & CAILLOL. Trois cas de kala-azar observés à plusieurs années d'intervalle dans la même famille. [**Three Cases of Kala Azar in One Family at Long Intervals.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1936. June 22. 52nd Year. 3rd Ser. No. 21. pp. 997-1000.

The paper describes an instance of family infection in kala azar in which three children of a family living in a suburb of Marseilles in a house on the dry hill-side contracted the disease—the first child in 1929 at two years of age, the second in 1932 at three years of age, and the third in 1936 at four years of age. During this time two other children in neighbouring houses were found to have kala azar. It is pointed out that sandflies and mosquitoes were little evident in the district but that dog ticks were abundant. That the ticks bit the children is evidenced by the fact that the first child suffered from *fièvre boutonneuse* during the year preceding that in which it fell ill with kala azar.

C. M. W.

DU (S. D.) & BEST (A. E.). **Kala-Azar in West China.**—*Chinese Med. J.* 1936. Mar. Vol. 50. No. 3. pp. 273-277. With 2 figs.

The presence of kala azar in Western China has been suspected for some time but no case proved by proper diagnosis has been reported. The case noted in this paper is one in which leishmania were demonstrated by spleen puncture. The patient was a military officer 31 years of age who without doubt contracted the disease in the north of Szechwan or in an adjacent area of Kanso.

C. M. W.

YOSEZATO (M.). **On the Distribution of Kala-Azar in the District of the Mukden-Shanhaikwan Line in Manchoukuo.**—*Jl. Oriental Med.* 1936. Aug. Vol. 25. No. 2. [In Japanese pp. 235-237. With 1 map. English summary p. 36.]

The survey carried out has indicated that kala azar extends further west than Mukden not only to Shankaikwan but also northward into the Jeho district.

C. M. W.

RAMIREZ (Bernardo). Un caso de kala-azar asociado a fiebre recurrente y con gran cantidad de leishmanias en sangre periférica. [**A Case of Kala Azar associated with Recurrent Fever and the Presence of Leishmania in Large Numbers in the Peripheral Blood.**]—*Medicina Países Cálidos*. Madrid. 1936. Aug.-Sept. Vol. 9. Nos. 8 & 9. pp. 406-407.

In 1931 a child one year of age from Guarromán in Spain was diagnosed as a case of kala azar by the discovery of leishmania in the peripheral blood (a single parasite) and in material from spleen puncture (many parasites). Successful treatment with neostibosan was carried out. Three years later the same child was brought to the malaria clinic suffering from fever and other symptoms. A thick blood film made for the purpose of malarial diagnosis revealed an enormous number of leishmania and also spirochaetes of relapsing fever. A cure was brought about by neostibosan treatment.

C. M. W.

HU (C. H.). **The Pathological Anatomy of Human Kala-Azar with Special Reference to Certain Hitherto Less Well Recognized Changes.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 1-12. With 12 figs. on 3 plates. [15 refs.]

During the post-mortem study of 31 cases of kala azar it became evident that certain pathological changes had not been sufficiently emphasized by previous workers. Though the increase in the reticulo-endothelial system is the most important and characteristic result of infection with leishmania other changes also occur. Frequently there is an extra-medullary formation of myeloid tissue on the dural surface of the skull with secondary growth of new bone on the inner surface. In the bone marrow there is a myelocytic hyperplasia which is often strikingly noticeable after the parasites and their containing cells have disappeared. There is an increase of the young myeloid cells, while the metamyelocytes and leucocytes are decreased in number; the normoblasts are in most cases either not greatly increased or probably decreased. In the spleen and bone marrow there is an increase of plasma cells which may persist for a considerable time after the disappearance of the parasitized cells.

C. M. W.

MOCHKOVSKI (Ch.). Quelques observations sur la coloration vitale des Leishmania. [**Vital Staining of Leishmania.**]—*C. R. Soc. Biol.* 1936. Vol. 121. No. 15. pp. 1607-1608.

Culture forms of leishmania taken from the surface of a medium and suspended in physiological saline solution may be vitally stained by placing a drop of the fluid on a slide on which an alcoholic solution of brilliant-cresyl blue has been allowed to evaporate. After staining, the flagellates in the fluid are exposed to the vapour of osmic acid and then spread into a film and dried. The film is then stained by Romanowsky stain. The nucleus is seen to have a violet red margin of chromatin and a blue central karyosome. In the cytoplasm are masses of a substance resembling the crinome of Chlopin. Between the masses the pellicle stained a violet red colour is seen. It is concluded that the masses consist of a substance which in life is uniformly distributed through the cytoplasm and that having a negative charge it is flocculated by the basic dye. This phenomenon is compared with the flocculation which occurs in polychromatophile erythrocytes.

C. M. W.

NATTAN-LARRIER (L.) & GRIMARD (L.). Existe-t-il des formes métacycliques dans les cultures de *Leishmania donovani*? [**Do Metacyclic Forms exist in Cultures of *L. donovani*?**]*—C. R. Soc. Biol.* 1936. Vol. 122. No. 24. pp. 993-996.

In following the development of *Leishmania donovani* in *Phlebotomus perniciosus* ADLER and THEODOR noted that the flagellates occurring in the proboscis were sometimes smaller than those which multiplied actively in the stomach. It was thought that these short flagellates might represent the metacyclic infecting forms. The authors of the paper under review have noted that similar dwarf forms 5-8 μ in length are liable to occur in old cultures, and they again suggest that they may be metacyclic forms, and point out that in cultures of *Trypanosoma lewisi* and *T. rabinowitschi* metacyclic trypanosomes are known to appear as the culture becomes old. C. M. W.

MAYER (Martin) & MALAMOS (B.). Zur Differentialdiagnose von *Leishmania donovani* und *tropica* durch Plattenkulturen. [**Differential Diagnosis of *Leishmania donovani* and *L. tropica* by Plate Cultures.**]*—Zent. f. Bakt. I. Abt. Orig.* 1936. June 12. Vol. 136. No. 7/8. pp. 412-418. With 6 figs.

Cultures of leishmania of oriental sore and kala azar can be differentiated by the type of growth on blood-agar plates (Nöller's medium). In the case of *Leishmania tropica* a streak inoculation gives in the course of a few weeks a growth which is characterized by off-shoots, sometimes branched, from the main streak, while *L. donovani* gives a simple streak without side outgrowths. These differences are shown by a number of different strains, some of which have been maintained in culture or in animal passages for a number of years. The parasite of S. American leishmaniasis resembles that of oriental sore. It is noteworthy that a strain of *L. tropica* which has been carried on through a number of passages in mice as a generalized infection resembling kala azar gave a growth like that of *L. donovani* of kala azar. C. M. W.

CHUNG (Huei-Lan). Studies on the Resistance of Leishman-Donovan Bodies to Various Physical, Chemical, and Biological Agents. Part I. The Resistance of Leishman-Donovan Bodies to Certain Physical Agents, namely, X-Ray, Heating, Chilling and Drying.—*Chinese Med. Jl.* 1936. Aug. Vol. 50. No. 8. pp. 1039-1050. [22 refs.]

The influence of various factors on *Leishmania donovani* as it occurs in the liver and spleen of experimentally infected hamsters was investigated by exposing the organs or an emulsion of the organs to these factors and then injecting the material intraperitoneally into hamsters. An emulsion after exposure to X-rays in doses of $\frac{1}{2}$ or 50 per cent. S.E.D. to 2 or 200 per cent. S.E.D., still infected hamsters [100 per cent. S.E.D.=one full skin erythema dose]. Heating to 40°C. to 43°C. for at least 30 minutes did not kill the leishmania, whereas a temperature of 44°C. did do so. The leishmania in liver were still viable after 72 hours at 5°C., but after 43 days' exposure to this temperature the leishmania had been killed. Suspended in normal saline solution they remained alive for eight days at 5°C. but were killed after 14 to 19 days. They withstood a 48 hour exposure to a temperature of 25°C. below zero. Drying in smears on a Petri dish for 1½ hours killed the leishmania. C. M. W.

DUBOIS (A.). Utilisation des glucides par *Leishmania tropica*. [**Utilization of Sugars by *Leishmania tropica*.**]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 141-144.

The author has tested the action of various sugars on the culture forms of leishmania by washing them in Ringer's solution and adding to a Ringer solution suspension of the flagellates solutions of sugars to give a strength in the final liquid of 0.2 per cent. At intervals after this the flagellates are examined for increase or decrease in numbers or for loss or increase in motility. The sugars which definitely activate the flagellates are glucose, levulose, mannose, galactose, saccharose, raffinose, inulin and glycerine. Maltose and dextrin were uncertain in action while without action were mannite, adonite, sorbite, dulcitol, amygdalin, arabinose, salicine, lactose, inositol, isodulcitol, xylose and glycogen. Washed flagellates which have become immobile in Ringer's solution after a few hours may be revived by the addition of certain sugars, such as glucose, mannose, levulose, galactose, inulin and glycerine. Other sugars lack this activating power. C. M. W.

SUN (C. Jung), YAO (Y. T.), CHU (H. J.) & WU (C. C.). **Natural Infection of *Phlebotomus chinensis* with Flagellates Morphologically Indistinguishable from those of *Leishmania donovani*.**—*Chinese Med. Jl.* 1936. July. Vol. 50. No. 7. pp. 911-916. With 5 figs. & 1 sketch map. [25 refs.]

The village of Wang Shih Koo Chuang is situated about 12 miles from Tsing Kiang Pu, a famous city on the bank of Grand Canal in North Kiangsu, China. It has a population of 237 persons living in 39 houses. In June 1935 there were found here 46 cases of kala azar distributed in 31 of the 39 houses. Between June 6 and July 16, 1935, there were collected 769 sandflies, of which 684 were females and 85 males. The majority were *Phlebotomus chinensis* and the rest *P. sergenti* var. *mongolensis*, *P. squamirostris* and *P. sp.* Of the female *P. chinensis* 421 caught in kala azar houses were dissected, with the result that in seven were found flagellates indistinguishable from the developmental forms of *Leishmania donovani* seen in *P. chinensis* fed experimentally on kala azar patients. In 26 of the sandflies O-shaped bodies, regarded as rounded forms of the flagellates, were found in the intestine. This record of naturally occurring sandfly infection is the first from China and brings the sandfly transmission problem in China into line with observations which have been made in India and elsewhere.

C. M. W.

SMITH (R. O. A.), LAL (Chiranji), MUKERJEE (S.) & HALDER (K. C.). **The Transmission of *L. donovani* by the Bite of the Sandfly *P. argentipes*.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 313-316.

This note records another, the fourth, success which has attended efforts to transmit kala azar to an animal by the bite of the sandfly *Phlebotomus argentipes*. The hamster (*Cricetulus griseus*) which became infected was one of 16, each of which on an average was subjected to 10 feeds by infected sandflies. The infection was detected when the animal was sacrificed 17 months later. C. M. W.

ESTRADA (A.). Les leishmanies peuvent se multiplier par schizogonie. [**Leishmania can multiply by Schizogony.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 722-726. With 1 fig.

In view of the publication by NATTAN-LARRIER and GRIMARD (this *Bulletin*, 1935, Vol. 32, p. 485) on the possibility of schizogony as a method of multiplication of leishmania, the author is led to record observations she had made on leishmania in smears of the spleen of a case of kala azar and on the culture forms of these organisms. She believes that she also has obtained multinuclear forms which she interprets as evidence of schizogony. C. M. W.

TENG (Chia-Tung) & FORKNER (Claude E.). **The Presence of Infective *Leishmania donovani* in the Urine and Prostatic Fluid of Patients with Kala-Azar.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 394-401. [16 refs.]

The intraperitoneal inoculation of the urinary sediment from 3 of 13 cases of kala azar and prostatic secretion from one of two cases gave rise to infection with *Leishmania donovani* in Chinese hamsters.

C. M. W.

TENG (Chia-Tung). **Negative Effect on Blood of Normal Rabbits of Inoculation of Killed *Leishmania donovani*.**—*Proc. Soc. Experim. Biol. & Med.* 1936. June. Vol. 34. No. 5. pp. 661-665. With 1 chart.

Repeated injection into rabbits of killed cultures of *Leishmania donovani* failed to reproduce the leucopenia which is such a characteristic feature of kala azar. A temporary fall in the number of leucocytes followed the inoculations but the normal condition was quickly restored.

C. M. W.

LESTOQUARD (F.) & DONATIEN (A.). Etude des *Leishmania* du derme cutané [**Examination of the Dermis for *Leishmania*.**]—*Bull. Soc. Path. Exot.* 1936. Apr. 1. Vol. 29. No. 4. pp. 422-430. With 25 figs.

In this article the authors discuss the recently introduced method for the diagnosis of kala azar by making films from scrapings of the dermis. Though they have already reported considerable success with this method, others who have attempted it have been less satisfied with the results. Accordingly they now refer to the difficulties which may be encountered and describe the technique to be adopted. In the first place the parasites in the skin may show certain abnormalities of form and size, there being less uniformity than is the case with the parasites seen in the usual smears from the internal organs. In the second place in obtaining films from the skin it is essential that as little blood as possible be obtained. The skin can be scarified with a vaccinostyle to the depth of the dermis in which occur the monocytes containing parasites. With some practice, material for film-making can be obtained with very little blood. Another method is to excise a wedge-shaped piece of skin of the right depth. The dermal edge of the piece of skin is then smeared on a slide. It is well not to make too large a smear so as to permit complete examination of the entire film after staining by the

usual method. This method has been practised for over a year at the Institut Pasteur d'Algérie for the diagnosis of human as well as canine cases, and the authors are convinced that it is an indispensable method for the discovery of leishmania. In 33 cases films made from dogs and sent to the institute from a distance gave positive findings.

C. M. W.

GIRAUD (P.), CIAUDO (P.) & BERNARD (R.). La séro-réaction au peptonate de fer ; son utilisation dans le diagnostic de la leishmaniose interne. [**The Peptonate of Iron Test for Kala Azar.**—*Marseille-Méd.* 1936. Mar. 15. Vol. 73. No. 8. pp. 355-371. [14 refs.]

The paper gives a description of a careful study of the peptonate of iron (Merck) test for kala azar, the test being positive when a definite flocculation is given on adding the reagent to the serum. The outcome of the work is that the authors are convinced that the test, which can be applied to the small quantity of serum obtainable from a finger-prick, is of definite value in the diagnosis of kala azar. It is admitted that a comparison has not been made with all the other serological tests employed in this disease.

C. M. W.

SÁNCHEZ BOTIJA (C.). Leishmaniosis canina. Algunas observaciones sobre los caracteres generales del foco endémico en Madrid. [**Canine Leishmaniasis. Observations on the General Characters of the Endemic Focus in Madrid.**—*Rev. Hig. e San. Pecuarias.* 1936. Mar. Vol. 26. No. 3. pp. 148-158.

During the year January 1935 to February 1936 amongst 2,230 dogs examined in Madrid 178, or 7.9 per cent., were found to be suffering from leishmaniasis. The cases were most common in the autumn. In 64 of a series of 128 infected dogs cutaneous lesions were present. These lesions were visible macroscopically in 78 per cent. of the 64 but visible only microscopically in the remaining 22 per cent. The diagnosis of the condition in dogs is discussed and it is concluded that reliance has to be placed on the clinical evidence and the examination of excised skin, especially that from the cutaneous lesions. Serological tests may be of assistance but they are not reliable enough for making conclusions as to the incidence of the disease.

C. M. W.

BOZZELLI (Roberto). Su alcuni casi di leishmaniosi viscerale del cane osservati in Messina. [**Some Cases of Canine Kala Azar observed in Messina.**—*Riv. Sanitaria Siciliana.* 1936. Aug. 15. Vol. 24. No. 16. pp. 869-874.

In this paper the author discusses some general problems connected with canine leishmaniasis in Messina and other places. Is canine kala azar caused by the same parasite as that producing the human disease ; is the dog to be regarded as a reservoir of the human virus ; why is it that though both oriental sore and kala azar occur in Sicily no cases of the former disease are seen in dogs, or is it possible that this disease in dogs is associated with a generalized infection, just as kala azar in these animals is frequently associated with cutaneous lesions ? These and other questions are discussed without arriving at any definite conclusions, though from the point of view of diagnosis of kala azar in dogs the clinical features are considered in some detail.

C. M. W.

YAO (Y. T.) & SUN (C. Jung). **Dermal Leishmaniasis in China.**—*Indian Med. Gaz.* 1936. Sept. Vol. 71. No. 9. pp. 519–520. With 3 figs.

The condition known as post-kala-azar dermal leishmaniasis, which is of fairly common occurrence in India, has not hitherto been recorded from other kala azar areas. The authors, who have been on the look out for this condition in China, now report three cases in which multiple depigmented areas were present over the body. In no case was there ulceration or nodule formation. Leishmania were demonstrated by culture method in the lesions of one of the cases, all of which had previously been treated for kala azar.

C. M. W.

VILLAIN (Georges), MARINI (Charles) & BELFORT (Joseph). Leishmaniose cutanée. [**Cutaneous Leishmaniasis.**]—*Tunisie Méd.* 1936. June. Vol. 30. No. 6. pp. 244–247.

The record of the case of a young man 19 years of age who developed a number of oriental sores after exposing himself to the bites of sandflies when sleeping in the open in Tunis. The first sore appeared on the back of a finger in about a fortnight, another developed on the leg five days later, while, subsequently, others appeared on the leg. Treatment consisted of applications of synectol, which appears to be a product of local plants made up in lanoline and cocoa butter, to some sores, and of anthiomaline, an antimony preparation, to others. The best results were obtained with synectol.

C. M. W.

CLASTRIER (J.). Sur un cas de bouton d'Orient observé dans l'Aurès (département de Constantine). [**Case of Oriental Sore in the Aures, Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. June. Vol. 14. No. 2. pp. 135–136.

In the department of Constantine (Algeria) oriental sore is known to occur all along the western border of the Aures mountains. The paper records the first case from the interior of the mountainous regions. It came from the valley of Oued el Abiodh, 720 metres above sea level.

C. M. W.

CORRADETTI (Augusto). Ricerche sui flebotomi della zona endemica di leishmaniosi cutanea in Abruzzo. [**Sandflies of the Endemic Oriental Sore Zone of the Abruzzi.**]—*Ann. d'Igiene.* 1936. Jan. Vol. 46. No. 1. pp. 13–17.

In endemic centres of oriental sore in Eastern Italy 486 sandflies (*Phlebotomus macedonicus*) captured in houses with cases of oriental sore were dissected without any evidence of leishmania infection being found. Of 51 sandflies taken in stables 5.09 per cent. contained human blood, while of 83 captured in houses 98.79 per cent. contained human blood. It would appear, therefore, that this sandfly shows little tendency to leave the place where it has obtained its meal of blood.

C. M. W.

CAMINOPETROS (J.). Reproduction de la leishmaniose cutanée humaine chez le spermophile *Citellus citellus*. [**Reproduction of Human Oriental Sore in the Spermophile.**]*—C. R. Soc. Biol.* 1936. Vol. 122. No. 16. pp. 45-47.

It is known that the inoculation of hamsters with *Leishmania tropica*, either subcutaneously or intraperitoneally, is often followed by a generalized visceral infection. In mice a generalized infection seems to be even more easily produced by intraperitoneal injection of *L. tropica* than of *L. donovani*. In the case of the spermophile (*Citellus citellus*) subcutaneous or intracutaneous injections of cultures of *L. tropica* or parasites taken from an oriental sore itself give rise to cutaneous lesions only, while intraperitoneal injections are never followed by cutaneous lesions. Thus inoculation into or under the skin of the sacral region gives rise in two or three months to a nodule covered with a dry crust. This increases in size for about a year and resembles very closely an oriental sore in man. Meanwhile the skin in the region of the joints of the hind limbs becomes swollen and copper-coloured while small nodules may appear on the skin of the tibio-tarsal region. In the damaged tissues leishmania can be found. Many of the parasites are peculiar giant forms. After about a year the infection retrogresses, but at no time is it possible to demonstrate a visceral infection. Animals which have been subjected to a previous subcutaneous, subconjunctival or intraperitoneal injection are in an allergic state and more sensitive to cutaneous reinoculation.

C. M. W.

NATTAN-LARRIER (L.) & NOYER (B.). Les infections de la souris par *Leishmania tropica*. [**Infections of Mice with *Leishmania tropica*.**]*—C. R. Soc. Biol.* 1936. Vol. 122. No. 23. pp. 902-904.

— & —. Le tropisme de *Leishmania tropica* chez la souris. [**Tropism of *Leishmania tropica* in the Mouse.**]*—Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 769-777.

From a series of experimental inoculations made in mice with a strain of *Leishmania tropica* received from the Hamburg Institute of Tropical Diseases the authors are led to the conclusion that, as regards their tendency to give rise to cutaneous lesions, generalized infections or involvement of the testes, strains vary considerably. The Hamburg strain inoculated into the skin at the base of the tail gave rise to a cutaneous lesion associated not infrequently with the presence of parasites in the liver and spleen. Inoculated intraperitoneally, a local intraperitoneal infection was produced associated with involvement of the liver and spleen, which occasionally showed large numbers of parasites as in kala azar. Very rarely testicular involvement occurred. The results are compared with those obtained by other authors in similar experiments.

C. M. W.

MARKIANOS (J.). Un cas de bouton d'Orient datant de cinq ans. [**Oriental Sore lasting 5 Years.**]*—Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 678-679.

Though oriental sore is generally recognized as a self-curing infection, sores beginning to heal spontaneously in about a year, this is far from being the general rule in Crete, where sores of two or three years' duration are quite common. The general belief that sores heal in about a

year is held by the people, who accordingly trouble little about attempting to cure the sores, which they think will soon disappear. This dangerous policy leads to various troubles such as case-to-case infections and unnecessary development of the sores and the subsequent scarring. A case is recorded where a sore on the cheek persisted for five years. A cure was obtained in two months by intravenous neostibosan and local applications of powder and solution of permanganate of potash.

C. M. W.

MONACELLI (Mario). Atipie cliniche e diagnosi biologica della leishmaniosi cutanea. [**Atypical Oriental Sore.**]—*Riforma Med.* 1936. May 23. Vol. 52. No. 21. pp. 707-14, 717. With 8 figs. [17 refs.]

Attention is called to the occurrence in Italy of cases of oriental sore which on account of the unusual character of the lesions are liable to be overlooked. One form is a non-ulcerating lipid type which, however, can hardly be regarded as atypical in Italy as cases of the kind constitute a fair proportion of all cases seen. True atypical cases are those in which there is a marked exaggeration of what may be called the normal oedema surrounding the sore. In these cases the condition resembles *lupus pernio* or *lupus tumidus*.

C. M. W.

CIACCIO (Ivan). Contributo alla sierodiagnosi della leishmaniosi cutanea. [**Serodiagnosis of Oriental Sore.**]—*Policlinico. Sez. Prat.* 1936. May 11. Vol. 43. No. 19. pp. 862, 865-6, 869-70, 873-4. [22 refs.]

In 14 cases of oriental sore the author has tested various serological reactions which are employed as an aid to the diagnosis of kala azar. These were the globulin test of Brahmachari, the aldehyde test of Napier, the antimony test of Chopra, and the combined antimony and aldehyde test as introduced by Nattan-Larrier and Grimard-Richard. It is concluded that these tests depend on a lack of colloidal equilibrium caused by a change in the albumin-globulin relationship and that, though not specific, they are suggestive of oriental sore when positive.

C. M. W.

DRUCKMAN (A.) & DOSTROWSKY (A.). **X-Ray Treatment of Leishmania Cutanea.**—*Harefuah.* 1936. June. Vol. 10. No. 6. [In Hebrew pp. 328-333. English summary pp. 2-3. With 2 figs.]

The report concerns 100 cases of oriental sore treated by X-ray irradiation. No optimal dose could be determined as much depends on the age and character of the sore. For advanced cases 250-300 "R" were used, while for early ones 400-600 "R" were employed. One week after the first exposure inspection of the sore usually revealed a response. If none was noted a second exposure was given and in some cases a third was required. When there is a reaction healing follows without further treatment. Usually all cases were treated with the following factors: 2 mm. Al. Filter, 150 KV., 6mA, and 30 cm. local distance. The irradiation extended over $\frac{1}{2}$ cm. of the surrounding skin. In large sores the central atrophic area was covered with lead

to protect the skin. From experiments carried out by exposing parasites to similar irradiations it was shown that these were not lethal. The treatment evidently stimulates the tissues rather than killing the leishmania. C. M. W.

KRASNJANSKIJ (M. W.) & LAWROW (A. P.). Versuch einer Behandlung der Hautleishmaniose mit Gold. [**Gold Treatment of Oriental Sore.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 518-520.

The authors report that they have had good results in the treatment of oriental sore by intravenous injections of 1/1,000 solutions of "solganol" or potassium gold cyanide. The solganol solution is given in doses varying from 0.5 to 5.0 cc. and the other solution in doses of 0.5 to 3.0 cc. As a rule after two to five injections there is an acute reaction around the sore, while in most cases complete healing has taken place after 10 to 15 injections. C. M. W.

PARREIRAS (Decio). Considerações sobre a gangosa e a espundia. [**Gangosa and Espundia.**]—*Folha Med.* 1936. July 25. Vol. 17. No. 21. pp. 368-369. With 2 figs.

In describing a case of extensive ulceration of the skin of the nose, cheeks and lips, with involvement of the naso-pharyngeal mucosa, giving rise to a condition of mutilating rhino-pharyngitis, the author discusses the diagnosis, which he considers might with justification be given as gangosa probably caused by leishmanial invasion—if gangosa be defined as "an ulcerative condition of the palate, nose, pharynx and skin surface"—or as espundia, if this be defined as naso-pharyngeal leishmaniasis. It seems clear from this case that certain tropical skin diseases require a redefinition of the criteria necessary for diagnosis. C. M. W.

ELIAS (Seraphim). Therapeutica da leishmaniose. [**Therapeutics of Leishmaniasis.**]—*Hospital.* Rio de Janeiro. 1936. Sept. 8th Year. Vol. 2. No. 9. pp. 1011-1017. With 6 figs.

Three cases of cutaneous leishmaniasis in Brazil, of which one had also lesions of the nasal mucosa, were treated successfully with intramuscular injections of fouadin (neo-antimosan). C. M. W.

SMITH (R. O. A.), MUKERJEE (S.), HALDER (K. C.) & LAL (Chiranji). **Bionomics of *P. argentipes*. Part I. The Duration of Life in Nature. With an Appendix by K. C. K. E. RAJA.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 295-311. With 1 graph.

In India *Phlebotomus argentipes*, the sandfly vector of *Leishmania donovani*, becomes infective about the time of its third feed, i.e., in 6½ days after a meal of infecting blood. The determination of the midge's length of life in nature is therefore a matter of practical importance, and in the series of experiments described in the present paper an attempt was made to solve the problem by the method of release and subsequent recapture. Before being set at liberty the insects were marked either by being dusted with finely powdered fluorescin or eosin,

or by the amputation under ether of a middle leg. Unfortunately, except in one case only a small percentage (3.6 for all experiments together) of marked flies was ever recovered, and no appreciable difference in the proportion recaptured was traceable to the method of marking. In all, 3,271 flies were released and 118 were recovered. For this result two species of predacious spiders and also lizards are thought to have been to some extent answerable, and the authors suggest that "one of the factors responsible for an epidemic of kala-azar" may possibly be "an alteration of balance between the insect vectors and their natural enemies."

The appendix supplies data obtained under artificial conditions, and shows that, out of 12,998 laboratory-bred flies which took a first meal of blood, 3,337, of which 236 were known to be infected, lived until the third meal. Thereafter the survivors rapidly diminished in number, and the last three flies expired at the age of from 24 to 26½ days.

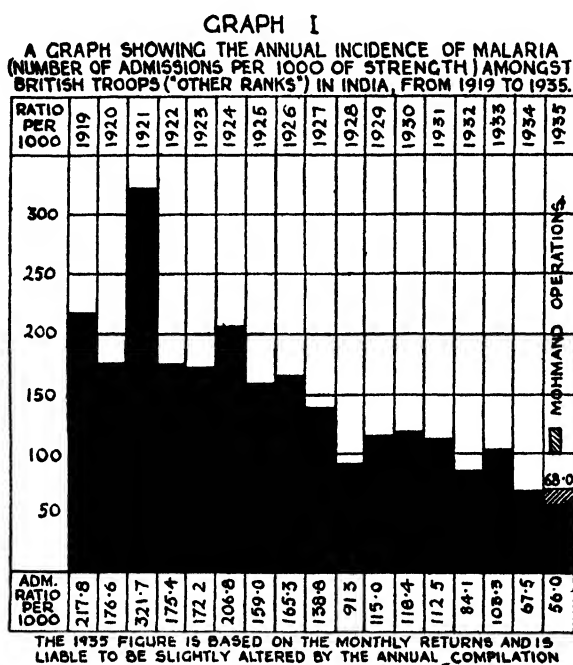
E. E. Austen.

TIMPANO (P). Il metodo di M. Ascoli nella cura della splenomegalia da malaria e da kala-azar. -- *Polichnico. Sez. Prat.* 1936. Nov. 9. Vol. 43. No. 45. pp. 2007-2009.

MALARIA.

AMY (A. C.) & BOYD (J. S. K.). **Malaria in India : the Synthetic Drugs and the Relapse Rate.**—*Jl. Roy. Army Med. Corps.* 1936. July & Aug. Vol. 67. Nos. 1 & 2. pp. 1-17 ; 83-95. With 4 graphs.

This study is based on the malaria statistics of the British troops in India, the average annual strength of which approximates 55,000. The number of hospital admissions for malaria has varied between 18,878 in 1921 and 3,676 in 1934. These figures include primary infections and relapses. The decline in admission rates during recent years is shown in the graph reproduced below :—



[Reproduced from the *Journal of the Royal Army Medical Corps.*]

A detailed study of these hospital returns has led the authors to the conclusion that the reduction in malaria incidence during the last few years is largely attributable to a reduction in the number of relapses. Generally speaking most primary attacks of malaria occur in the second half of the year ; most relapses in the first half. It is realized that there are many exceptions to this generalization but it is justified in the main. If the reduction in the relapse rate is a predominant factor in determining the reduction in admission rates, then the hospital admissions for malaria in the first half of the year should form a smaller proportion of the number of admissions during the preceding six months than formerly. This is the case. The admission rate for January to

June expressed as a percentage of the admission rate for the previous July to December was :—

1928-29	1929-30	1930-31	1931-32	1932-33	1933-34	1934-35
31·8	24·7	28·4	24·1	22·9	16·8	16·9

Further evidence of the reduction in the number of relapses is furnished by the experience of the Kasauli Malaria Treatment Centre : this was opened expressly for the treatment of intractable malaria cases. The numbers of cases admitted to this centre were :—1928, 243 ; 1929, 248 ; 1930, 341 ; 1931, 126 ; 1932, 63 ; 1933, 51. Thereafter the Centre was closed for lack of suitable cases to treat.

Fewer relapses might conceivably be the result of a change in the prevailing type of malaria. Of this there is no evidence. A comparable reduction has not been noted among Indian troops. Moreover, malignant tertian cases expressed as percentages of benign tertian cases, though subject to wide fluctuations from year to year, have shown no defined upward or downward tendency.

The decline in the relapse rate runs *pari passu* with the introduction of plasmoquine ; in 1929-30 it was used experimentally in certain selected hospitals. In 1931 a limited quantity was distributed to hospitals. In 1932 it was available for general use but it was given in inadequate doses. In 1933 standard courses of treatment were introduced, quinine and plasmoquine or atebirin and plasmoquine.

As the result of their experience the authors recommend the following standard treatment for British troops in India. The patient is put to bed and purged with calomel followed by Epsom salts. Quinine is then given until initial febrile paroxysms are controlled. Quinine is then stopped and atebirin is given, 0·3 gm. a day for 7 days. The patient is then allowed to get up and receives 0·03 gm. of plasmoquine a day for a further 5 days.

Norman White.

COVELL (G.) & BAILY (J. D.). **Malaria in Sind. Part XV. The Effects produced by the Operation of the Lloyd Barrage Scheme on the Incidence of Malaria in Sind.**—*Records of the Malaria Survey of India*. 1936. Sept. Vol. 6. No. 3. pp. 387-409. With 1 map. [12 refs.]

The Lloyd Barrage came into operation in 1932. Ever since 1927 systematic malaria surveys have been carried out in selected areas in Sind which were likely to be influenced by this large irrigation project. Since May 1928, 145,000 spleen examinations and 35,000 blood examinations have been made. An assessment of the effects of the barrage on malaria conditions is complicated by the fact that this part of India has been subject to severe regional epidemics of malaria at intervals of approximately 10 years, the last occurring in 1929. Moreover the rainfall, which is normally very scanty, is subject to large variation, in amount and distribution, from year to year. Parts of the Province where dry crops were grown had formerly little malaria ; on the other hand, rice growing tracts, villages on the banks of " dead " rivers, villages where extensive date palm cultivation is carried out, and a tract subject to annual flooding from the Indus, were highly malarious.

The barrage has produced a rise in subsoil water and has hindered the inflow of seepage water that formerly occurred in the winter ; it has

also led to an increase in rice cultivation, and the irrigation season in the old rice growing areas has been prolonged by several weeks. In places there is serious water-logging. These conditions, together with seepage from some of the new canals, have, in the opinion of the authors, aggravated the malaria problems of Sind. In many places there has been an increase in malaria incidence since the barrage came into operation. In areas which suffered from the regional malaria epidemic of 1929 there are villages in which the spleen rate, though lower than that observed immediately after the epidemic, is still very much higher than in the previous inter-epidemic period.

As regards the future much depends on the success of the Irrigation Department in providing efficient drainage. "Attention is drawn to the vital importance of making a soil and subsoil survey of the area involved, as well as providing an efficient scheme of drainage, before any large irrigation project is undertaken."

N. W.

COVELL (G.) & BAILY (J. D.). **Further Observations on a Regional Epidemic of Malaria in Northern Sind.**—*Records of the Malaria Survey of India*. 1936. Sept. Vol. 6. No. 3. pp. 411-437. With 1 map & 19 graphs.

Regional fulminant epidemics of malaria occur every 10 years or so in Northern Sind where malaria is normally but little prevalent in inter-epidemic periods. The last such epidemic occurred in 1929; observations made in Shikarpur, before, during and after that epidemic were recorded by the authors in the *Records of the Malaria Survey of India*, Vol. 3, No. 2 (see this *Bulletin*, 1933, Vol. 30, p. 460). The present contribution is concerned with further observations made in Shikarpur and adjacent villages during the five years following the 1929 epidemic.

The spleen rates about eight months after the epidemic were of the order of 80 to 90 per cent., as compared with some 10 per cent. in the pre-epidemic period. The decline in the rates since then has not been so marked as experience in the Punjab, for example, entitled one to expect. In some places spleen rates have fallen to their former levels but in others rates of 50 per cent., or even higher, are still being recorded. Unusually heavy rainfall in 1932 and 1933 may be partly responsible for this, but the main cause relates to conditions arising out of the operation of the Lloyd Barrage (see above).

P. falciparum infections are most numerous and important: crescents are very rare immediately before the malaria season but become abundant at its height. *P. vivax* infections occur in some numbers at the commencement of the malaria season; at its close the *vivax* parasite rate falls almost to zero. A number of benign tertian cases occur in the spring and early summer; these are believed to be chiefly caused by infection acquired the previous autumn. The annual malaria season in this part of Sind is thus "in the main a mild replica of the great regional epidemics."

In conclusion the authors draw an interesting comparison between the Sind epidemic of 1929-30 and the Ceylon epidemic of 1934-35, about which there is already an extensive literature. They consider that the course of events in the two epidemics was very similar; the precipitating cause in both cases was the sudden production of conditions favouring extensive propagation, longevity and activity of *A. culicifacies*

in the midst of a non-immune population. They do not consider that the first wave of morbidity, in either case, could conceivably have been an epidemic of relapses.

N. W.

MOLONY (J. B. de W.) & GORMAN (J. H.). **Malaria in Quetta. An Analysis of the Statistics of Admissions to Military Hospitals, and their Correlation with Temperature, Humidity and Rainfall.**—*Records of the Malaria Survey of India*. 1936. June. Vol. 6. No. 2. pp. 273–288. With 2 graphs.

This is an interesting statistical analysis. The annual hospital admission rates for malaria among British troops in Quetta are not significantly correlated with the annual rainfall during the years 1888 to 1934. This may be due to a lack of correspondence between rainfall registered in Quetta and the rainfall on distant hills that is responsible for flooding in the Quetta plateau. Monthly malaria admissions from 1926 to 1934 among British and Indian troops are positively and significantly correlated with mean daily minimum and maximum temperatures; negatively and significantly with the relative humidity recorded in the mornings. There is no statistical evidence of effectual control of malaria in Quetta between 1888 and 1934. For some unexplained reason, however, the hospital admission rates for malaria between 1900 and 1913 were very appreciably lower than they were during the previous and subsequent periods.

N. W.

MULLIGAN (H. W.) & BAILY (J. D.). **Malaria in Quetta, Baluchistan.**—*Records of the Malaria Survey of India*. 1936. June. Vol. 6. No. 2. pp. 289–385. With 2 charts, 1 diagram, 7 graphs, 1 folding map & 8 figs. on 3 plates. [37 refs.]

This is an admirable survey report. The survey which was carried out between July 25 and October 9, 1935, was preceded by a preliminary reconnaissance in May 1935, immediately prior to the disastrous earthquake. The large amount of information collected during two and a half months is indeed remarkable. The report should be of the greatest value to those responsible for the rebuilding of Quetta. It contains, moreover, facts of much general interest, and though survey reports of this nature are difficult, or impossible, to summarize, an endeavour will be made to direct attention to those features of the report that are likely to be of chief interest to the malariologist.

Quetta, the capital of Baluchistan, lies on a bare plateau between 5,000 and 6,000 feet above sea level. It is in the extreme west of British India. The night temperatures are always cool or cold: the mean temperature in summer is 78°F. and in winter 40°F. There is a large garrison. The population of Quetta at the time of the earthquake in May 1935 was estimated at 60,000. The population is largely a floating one; many visitors come from malarious districts but it is probable that Quetta exports as much, or more, malaria than is imported.

Quetta has had an unenviable reputation for malaria for many years but this is the first comprehensive malaria survey that has been carried out there.

The anopheline fauna of Quetta is rich and is of special interest as containing Mediterranean, Indian and Oriental species (according to the grouping of Christophers). It would appear to be close to the eastern limit of distribution of the Mediterranean species and to the

western limit of distribution of the Indian and Oriental species. The following species were captured:—Mediterranean: *A. superpictus*, *A. dhali*, *A. pulcherrimus*, *A. sergenti*, *A. multicolor*. Indian: *A. culicifacies*, *A. stephensi*, *A. turkhudi*, *A. fluvialis*. Oriental: *A. lindesayi*, *A. subpictus*; and a new species, *A. habibi*. Larvae of *A. moghulensis* were also found. A total of 14,072 anophelines was identified of which 7,049 were bred from larvae and pupae. The number of anopheline females dissected and examined for malaria infection was 3,044. Of the thirteen species found only five were in numbers sufficient to warrant any suspicion that they might play a part in the transmission of malaria, namely, *A. superpictus*, *A. culicifacies*, *A. stephensi*, *A. dhali* and *A. turkhudi*. Of these the first three were by far the most numerous and were the only species of which infected females were found. The relative potential danger of these three species to the community is determined by multiplying figures representing relative prevalence of wild-caught females by the percentage of infections as determined by dissection. Thus expressed the importance of these species as vectors of malaria in Quetta are *A. stephensi* 1, *A. culicifacies* 6.6 and *A. superpictus* 11.3. There is some evidence to suggest that had it not been for malaria control measures that were being undertaken in part of the area *A. stephensi* might have been a relatively more important vector than the above figures suggest.

Though *A. superpictus* has long been recognized as an important vector of malaria in Mediterranean countries and in the Near East, this is the first report of its playing a similar rôle in India, and, moreover a preponderating rôle. Of the total adult anophelines caught 53 per cent. were of this species, while of the 7,049 anophelines bred 45 per cent. were *A. superpictus*. Of the 1,412 *A. superpictus* females dissected 4.9 per cent. were found to be infected.

A. culicifacies formed 23 per cent. of the total adult catch and 21 per cent. of the bred specimens. Of the females examined 5.1 per cent. were infected. This species is generally recognized as being the most important vector in India as a whole.

A. stephensi, another dangerous Indian vector, especially in urban areas, formed 17 per cent. of the total adults caught and 17 per cent. of the bred specimens. Of the 719 females dissected 1 per cent. was found to be infected.

The close similarity of the figures representing the relative prevalence of these three species based on the number of adults captured and on the number bred from larvae and pupae, respectively, is remarkable.

Very full information is supplied regarding the breeding-places, the diurnal resting places and the dispersion of these three species, as well as summarized accounts of the rôle they play elsewhere as vectors of malaria.

The spleen rates among children in the neighbouring villages were, September 1935, round about 70 to 80 per cent. In Quetta City itself it was 31 per cent.

It appears that the transmission of malaria in Quetta is restricted to a very short period of the year, most infections occurring in July, August and September. The intensity of malaria varies very considerably in parts of the plateau at no great distance apart: this is admirably described and illustrated in a map. If due advantage be taken of this information in the rebuilding of Quetta this very important military station may be healthier in the future than it has been in the past.

N. W.

STRICKLAND (C.) & CHAUDHURI (H. P.). **More on Hill Malaria.**—*Indian Med. Gaz.* 1936. May. Vol. 71. No. 5. pp. 267-269.

The authors fed *A. stephensi* on malaria patients in Calcutta during the autumn malaria season. Some of these mosquitoes were kept in Calcutta where 58.5 per cent. showed infection, others were transported at once to the lower Himalayan hills where only 6 per cent. developed infections. They conclude that "at about the altitude of 2,500 to 4,000 feet in the hills there is practically no autumnal malaria . . . physical conditions debar infection in the mosquito. People can therefore go without mosquito nets with impunity at this season. The spring epidemic of malaria in the lower hills of the Himalayas is not to be considered as a manifestation of Autumn infection."

W. Fletcher.

VISWANATHAN (D. K.). **Epidemic Malaria in Madras Presidency.**—*Records of the Malaria Survey of India.* 1936. June. Vol. 6. No. 2. pp. 239-271. With 8 charts. [23 refs.]

Severe epidemic malaria of the kind that, from time to time, has afflicted the more northerly Punjab Province in India, has rarely been reported from the Madras Presidency. It is, indeed, often assumed that it does not occur there. Considerable interest attaches, therefore, to the record of outbreaks in the districts of Bellary, Anantapur, Kurnool, Cuddapah and in the coastal areas of Ganjam and Vizagapatam, with total annual mortality rates ranging from 39 to 49 per mille. The greater part of Viswanathan's report is devoted to a description of an epidemic of malaria that occurred in 1933-34 in parts of the Anantapur and Bellary districts. This was associated with two years of abnormally high rainfall. Both *P. vivax* and *P. falciparum* infections were observed—in about equal proportions at the height of the epidemic. *Anopheles culicifacies* appears to have been solely responsible for the spread of the disease. *A. subpictus* and *A. stephensi* were also found, in a limited mosquito survey. The highest monthly mortality rate recorded during the epidemic was 175 per mille. The peak of the mortality curve was bimodal even in the lower age groups of the population. This fact and other considerations lead the author to postulate either the presence of different strains of parasites with different antigenic properties, or an enhancement of virulence of strains by repeated passage through insect and human hosts, or more probably a combination of these two factors. N. W.

HACKETT (L. W.). **Biological Factors in Malaria Control.**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 341-352. [12 refs.]

This is an attractively written account of the disappearance of malaria following upon agrarian development, "species sanitation," changing races of *maculipennis*, and the like.

"The map of malaria in Europe has come to resemble in its broad lines the map of distribution of the dangerous races of the *maculipennis* group. But the natural disappearance of malaria over large areas has been due not only to the occurrence of a kind of anopheline which lives by preference on domestic animals, but also to a certain trend of events. There has been evolution in agriculture. The primitive method of

occasional sowings interrupted by long fallow periods during which the land is abandoned to natural pasturage still persists in unprogressive or scarcely populated regions, but beginning in north-western Europe there has been during the last century a rapid extension of the practice of crop rotation. Every two or three years the fields are planted to legumes for the enrichment of the soil. This would result in an excess of fodder crops unless the economic balance were restored by an increase in livestock. Thus animal husbandry develops as an economic necessity and stall feeding substitutes natural pasturage. There is no grazing land left, for instance, in north Italy. This produces optimum conditions for the zoophilic anopheles. In the rice growing district lying between Turin and Milan, which might boast, if it cared, the greatest anopheline production of all Italy if not of all Europe, malaria has quietly faded out as modern agricultural methods have been adopted. If this be so, and there is no reason to doubt it, it may be contended on excellent grounds that the most important step ever taken against malaria has been the introduction of rotation of crops, considering the extent and importance of the area already rendered malaria free in Europe by this agricultural transformation." W. F.

BISHOPP (F. C.) & SMITH (C. N.). **Mosquito Work throughout the World in 1934.**—*Proc. 22nd Ann. Meeting New Jersey Mosquito Extermination Assoc.* 1935. pp. 50-77. [Summary taken from *Public Health Engineering Abstracts*. Wash. 1936. Aug. 29. Vol. 16. Signed Claud BROWNING.]

This paper, given at each annual meeting of the New Jersey Mosquito Extermination Association, records the history of mosquito control throughout the world for the year 1934. The subjects of necrology, taxonomy, mosquito-borne diseases, hibernation, laboratory technique, natural enemies, and larvicides, are treated and the work of the past year is recorded. A résumé of the control work against pest mosquitoes in the United States and Canada is given, a separate report being made of the work done in each State. Some discussion of the use of relief labour is given, and it is pointed out that some projects such as soil erosion are being carried on without adequate regard for mosquito control. This paper contains valuable information, references and data.

QUARTERLY BULLETIN OF THE HEALTH ORGANISATION. LEAGUE OF NATIONS. Geneva. 1936. Mar. Vol. 5. No. 1. pp. 110-139. —**Malaria under African Conditions.** [Report of Committee on Malaria and Resolutions of Pan-African Health Conference, Johannesburg, Nov. 20-30, 1935, pp. 110-113.] Ross (G. A. Park). **Insecticide as a Major Measure in Control of Malaria, being an Account of the Methods and Organisation put in Force in Natal and Zululand during the Past Six Years** [Annex I. pp. 114-133. With 1 map & 1 fig.]. DE MEILLON (B.). **The Control of Malaria in South Africa by Measures directed against the Adult Mosquitoes in Habitations** [Annex II. pp. 134-137]. DE BOER. **Malaria Control by Planting of Swamps** [Annex III. pp. 138-139].

This is mainly an account of the success of hut-spraying in Natal.

The Committee on Malaria considered that "malaria occupies one of the foremost places—if, indeed, not the foremost—among the infective

diseases of Africa as a cause of mortality and morbidity in the indigenous populations." They emphasized again and again, in their report, that economic improvement is an essential preliminary, and they record their opinion that, "without raising the economic status of the vast bulk of the population of Africa as a whole, there can be no hope of applying the results of research on a continental scale or of improving the position of great populations with regard to malaria as a disease."

The following resolutions were adopted by the Conference :—

"The Conference recommends :

"1. That advance with regard to malaria is, in the first place, required along the following lines :

- (a) The improvement of the economic status of the African ;
- (b) The study of malaria as a disease ;
- (c) The extension of research into the bionomics of the dangerous anophelines of Africa.

"2. That, in view of the widespread nature of malaria infection and the part that tolerance to this condition must play in the lives of the indigenous populations under existing conditions, more intensive research be carried out in Africa on the following particular problems :

- (a) Child mortality from malaria in indigenous communities ;
- (b) The extent to which the working capacity of the indigenous adult population is interfered with by malaria ;
- (c) The influence of malaria on racial increase ;
- (d) The influence of occasional drug treatment on immunity and particularly the question whether there is any danger to a primitive community in such treatment ;
- (e) The influence of malaria infection in conjunction with other infections on the mental development of African children ;
- (f) The various strains of the malaria parasite in Africa and the action of various therapeutic substances on the various strains, and especially on the gametes of these strains.

"3. That the apparent successful results in control of malaria obtained in certain areas by the destruction of adult anophelines with insecticidal sprays warrant a continuance of research.

"4. That consideration be given to the possibility of holding from time to time advanced courses in Africa for the study of malaria and its prevention under African conditions.

"5. That, while research along the lines suggested in the foregoing resolutions is an urgent matter, it must not be forgotten that, without raising the economic status of the vast bulk of the population of Africa as a whole, there can be no hope of applying successfully on a continental scale the results of research or of markedly improving the position of great populations with regard to malaria as a disease."

In the first Annex to this Report, Dr. G. A. Park Ross gives an account of "Insecticide as a Major Measure in Control of Malaria, being an Account of the Methods and Organisation put in force in Natal and Zululand during the Past Six Years." He describes the progress of the epidemic which invaded these countries in 1929 and overran almost the whole of them during the next three years. He writes that "Having failed by larvicides plus quinine treatment to get control of epidemic malaria, which began in 1929, we have, for the past three years, fought it by a campaign on the grand scale against the adult mosquito plus the other measures mentioned. . . . In uncivilised areas we have had to depend almost entirely on insecticide, which is at once cheap, easy to apply and attractive to native people. Our sugar industry is unanimous as to its efficacy and has made its use compulsory. Our towns have followed suit and regard it of the utmost service in dealing with slum areas."

The insecticide used was concentrated Pyagra (a pyrethrum compound) diluted 1 in 18 with paraffin. The cost, ready mixed, is about 2s. 9d. per gallon (4,543 cc.) and the amount required is 100 cc. per 1,000 cubic feet.

It must not be thought that the hut-spraying was an entirely simple matter, or that nothing else was done. Anyone wishing to adopt this method should read Dr. Park Ross's account of the establishment of local committees, and of the training of Zulu demonstrators and assistants who gained the confidence of their countrymen and instructed them in anti-malaria work and treatment. In the native reserves, "during the winter, extensive spotting is maintained to locate *A. gambiae* breeding places, and these are dealt with if at all possible." The hut-to-hut distribution of quinine had already proved a failure, but hundreds of quinine depots were established where quinine and instructions were issued free of charge to those who of their own free will applied for it. A short quinine treatment of 30 grains a day for one week proved more satisfactory than the long treatment which was formerly given. "The reduced dosage has been used for three years. Every native malaria assistant is in favour of it."

Dr. B. de Meillon reports in a second annex, that "Where breeding is very restricted or cost a minor consideration, anti-larval measures must and have proved to be very effective. In Natal and Zululand, however, there are vast tracts inhabited by a scattered population in which anti-larval work is very difficult, because of the high rainfall or much exposed water and where the cost of its thorough application is prohibitive." In two experiments carried out in a native reserve, he found that hut-spraying cost only about a third of anti-larval work and that it was more effective. It is made quite clear that "Measures directed against the Adult Mosquitoes in Habitations" are unlikely to be universally successful. Similar success is unlikely to be attained in countries where the important vectors are mosquitoes belonging to species such as *A. maculatus* and *A. minimus* which leave the house when they have fed. "*A. funestus* and *A. gambiae* are almost entirely house-frequenting insects . . . most infected insects are found indoors. . . . *A. funestus* remains indoors until its eggs are matured. *A. gambiae* probably does the same." W. F.

TOWNSEND (Eleanor Winthrop). **Leucocyte Counts in Malaria. Analysis of 100 Cases.**—*Southern Med. Jl.* 1936. Oct. Vol. 29. No. 10. pp. 1026-1029.

This study of the leucocyte counts in malaria is based on 100 consecutive cases of the infection admitted to the Roper Hospital, Charleston. BEREGOFF in a previous study of leucocyte counts in tropical diseases, which included 560 cases of malaria, noted that the percentage of non-segmented neutrophils was greater according to the degree of severity of the infection, that a progressive increase in the segmented type with increased total count is of good prognostic significance, and that patients dying in coma had low total leucocytes, low polymorphonuclear total and relative increase in non-segmented types.

Among the author's 100 cases, 16 had counts of 10,000 or more leucocytes per cmm. In three of these, causes other than malaria were present which might give rise to leucocytosis. Of the remaining 13, five were between 1 and 9 years of age, and eight were over 12 years. Four had benign tertian, six subtertian, two both these, one was not

determined. Two ended fatally, one was a coloured girl of 7 years, with 5 days' illness, no chills, but stuporous; her white cell count was 29,800 with 75 per cent. polymorphonuclears, 20 per cent. lymphocytes and 5 per cent. mononuclears. The other was a boy of 12 years, also coloured, with daily chills, jaundice and vomiting. His total count was 12,200, with 58 and 42 per cent. polymorphonuclears and lymphocytes respectively.

Of the 84 without leucocytosis two died. One was a white man of 57 years, with 3,100 leucocytes per cmm., 71 per cent. polymorphonuclears. The other was a coloured boy of 12 years with subtertian malaria; the total count was 4,900 and 63 per cent. polymorphonuclears.

The author did not observe any relationship between paroxysms and leucocyte counts. The conclusions are of rather a negative character, but the occurrence of leucocytosis in 13 out of 97 cases (13.4 per cent.) where malaria was the only ascertainable cause, whereas it was absent in 84 cases (86.6 per cent.) with a comparable range of temperature would warrant further study. The author adds: "The importance of such findings in relation to differential diagnosis is enhanced by the frequency of cases in which history and symptoms on admission suggested an acute surgical intra-abdominal lesion." *H. H. S.*

WANG (C. W.) & LEE ¹¹ U.) **Malaria and Relapsing Fever following Blood Transfusion including the Report of a Case of Congenital Transmission of Relapsing Fever.**—*Chinese Med. J.* 1936. Mar. Vol. 50. No. 3. pp. 241-248.

Fifty-four cases of benign tertian malaria and 6 of relapsing fever have followed blood transfusions in the Peiping Union Medical College Hospital in the ten-year period 1925-35, during which 3,700 transfusions were performed. In one case a pregnant recipient was infected with relapsing fever and passed it on to her premature infant who died of it. Malaria parasites were found in only one of 18 donors incriminated. One donor gave blood to 10 people in 1925, and two became infected. He was not used again till 1933, when he infected 3 out of 10 inoculated with his blood. He admitted having had a malaria-like fever 20 years before. *W. F.*

ZELMANOVA (F.). Morphologie comparée des modifications des hématies parasitées par les plasmodiums du paludisme et les facteurs déterminant la possibilité de déceler ces modifications dans les préparations colorées. [**Methods for demonstrating Alterations in Red Cells caused by Malaria Parasites.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 401-404. French summary p. 404.]

The author describes the methods of staining blood-films with the object of demonstrating the various alterations undergone by the red-cells harbouring malaria parasites. The addition of Manson's methylene-blue solution to Giemsa's stain is recommended in order to increase the azur content and alkalinity of the latter. Schüffner's dots are brought out best with a mixture of 1 drop Giemsa + 1 drop Manson solution (1:20 dilution) per 1 cc. tap-water, staining 2 hours; for Maurer's dots the same proportions of these stains are used, but Manson's solution is in a dilution of 1:5, and the staining lasts 1½ hours. The stippling is seen best at pH 7.8, using tap-water. *C. A. Houre.*

TOPORKOV (T. M.). Sur la présence des hématozoaires du paludisme dans les organes pendant la période latente. [**The Localization of Malarial Parasites during the Latent Period of Infection.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 405–410. French summary p. 411.]

In 178 cases with a present or past history of malaria the author made parallel examinations of smears from the peripheral blood and various internal organs, with the object of establishing the localization of the parasites during the latent period of the disease. The parasites were found in the blood of inner organs only when they were also present in the peripheral blood. It is concluded that they are not stored in these organs during the latent period; moreover, it is shown that they are destroyed in the spleen. The absence of the parasites from the peripheral circulation between the attacks is attributed to an extreme diminution of their numbers, when the probability of encountering them in the thick drop is near zero. This contention is corroborated by successful infection of G.P.I. cases with malarial blood which failed to reveal any parasites in the thick drop. C. A. Hoare.

DE BUCK (A.). **Degenerated Cysts and Black Spores in Anopheles infected with Benign Tertian Malaria.**—*Proc. Acad. Sci. Amst.* 1936. Vol. 39. No. 4. pp. 559–563. With 9 figs. on 2 plates.

This is an interesting dissertation on the nature of degenerated cysts and black spores in infected anophelines. Reference is made to an unusual type of clear degenerated cyst with a large brown or yellow centre which in its turn may have a darker inner part. These cysts appear to develop normally until sporozoites are found in the glands. Some of these cysts exhibit a few small black spores adhering to the brown centre: these small black spores, the author thinks, may be a stage in the development of sporozoites into typical black spores, the well known sausage or banana-shaped bodies.

Black spores are stated to be as frequently seen on the salivary glands as on the stomach: they do not occur in the cells of the glands but only on the coelomic surface. The author is convinced that typical black spores are associated with sporozoites and are never found in uninfected anophelines. They are, moreover, not found before the cysts have reached maturity. N. W.

STRATMAN-THOMAS (W. K.) & BAKER (F. C.). **Anopheles barberi Coquillett, as a Vector of Plasmodium vivax Grassi and Feletti.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 182–183.

This note records the successful transmission of *P. vivax* with an *A. barberi* reared from a larva collected in a tree hole near Ithaca, New York. N. W.

TRENSZ (F.). Courbes sérologiques chez des paludéens en traitement. [**Serological Curves in Malaria Patients under Treatment.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 749–758.

Weekly serological examinations, over a long period of time, were made of 46 patients suffering from malaria and the results of these examinations were plotted as serological curves. The technique used was the author's modification of Henry's reaction, using soluble

melanin (see this *Bulletin*, 1935, Vol. 32, p. 790.). Vernes's photometer was used for the readings. The author endeavoured to determine the utility of such curves in diagnosis, prognosis and treatment. Are such curves of greater utility than isolated examinations? To what degree are such curves comparable to serological curves in syphilis? Should treatment be continued until the patient is "serologically cured" and thereby relapses prevented?

His patients can be classified in three groups. In the first the serological index, at first positive, becomes completely negative under treatment. These were for the most part primary infections with *Pl. falciparum*. In the second group the serological index at first responds to treatment but at a certain moment fails to do so and continues more or less as a horizontal line. These cases were mostly persons who had been long infected and were suffering from relapse or reinfection; many had enlarged spleens and livers with blood proteins unbalanced. In the third group the serological index fails to respond to treatment: some of these patients were suffering from acute malaria, with parasites in the blood, and failed to respond to treatment. Others were chronic cases and were apparently immune.

A certain correspondence between the degree of enlargement of the spleen and the serological index was noted:—

Size of Spleen.	No. of Patients.	Mean Serological Index
Normal	4	47
Palpable	4	62
1-4 fingers	13	101
Handsbreadth	8	182
2-4 hands	7	231

N. W.

LORANDO (N.) & SOTIRIADES (D.). **Immunity in Malaria. Therapeutic Results obtained from Subcutaneous Injection of Immunized Blood.**—*Jl. Trop. Med. & Hyg.* 1936. Sept. 1. Vol. 39. No. 17. pp. 197-204. With 8 figs. [14 refs.]

This paper contains a general discussion of the acquisition of immunity in malaria and interesting clinical notes of 23 cases of malaria in children treated with subcutaneous injections of maternal blood. Such injections were followed by a reduction in the size of the spleen, remarkably rapid in some cases, and a rapid fall in temperature. Three injections of immune blood, combined with small doses of quinine for from five to ten days, are sufficient to effect a clinical cure and to develop an immunity the duration of which, however, has not yet been determined. The authors believe that the antibodies in the immune blood have no direct effect on the parasites, but act through the macrophages of the reticulo-endothelial system. N. W.

DUNN (C. L.). **Some Observations on the Therapeutics of Malaria in Ceylon.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936 July 31. Vol. 30. No. 2. pp. 233-244. [17 refs.]

This latest addition to the already considerable literature of the 1934-35 Ceylon malaria epidemic is confined solely to the treatment

of the disease. The report is based, for the most part, on the opinions of local medical officers with large experience. Controlled experiments are obviously difficult to carry out during an epidemic of such magnitude.

The main impression one gets from a perusal of the report is that quinine is still the most effective and convenient drug for the mass treatment of malaria. The course of treatment recommended locally is 22½ grains daily for seven days. For a very short course, a three days treatment of quinine 30 grains and plasmoquine 0.02 gram a day gives good results if the parasites exhibit no abnormal virulence. Atebrin is considered unsuitable for mass distribution. Combinations of atebrin and quinine, and atebrin and plasmoquine, were found to be more toxic in their effects than when given alone. N. W.

RAGIOT (Ch.) & MOREAU (P.). Paludisme, hématurie quinique, quinacrine. [**Quinacrine in Quinine-Haematuria.**—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 496-500.]

The authors describe a severe case of subtertian malaria in which haematuria occurred subsequent to the administration of two intramuscular injections of 1 gm. of quinine and 0.5 gm. of the same drug by the mouth. Injections of quinacrine (French atebrin) were then given instead of quinine, 0.2 gm. in the morning and 0.1 gm. in the evening for 4 days. The patient improved quickly, the haematuria stopped at once, the schizonts disappeared in 3 days, and treatment with quinine was then resumed without recurrence of the haematuria. Abundant schizonts were present in the blood during the occurrence of the haematuria, and the authors suggest that this may be a point of distinction between haematuria due to quinine and the haematuria of blackwater fever in which the parasites disappear from the blood.

RAGIOT (Ch.). Paludisme pernicieux. Traitement par quinine et quinacrine.—*Rev. Méd. et Hyg. Trop.* 1936. Sept.-Oct. Vol. 28. No. 5. pp. 290-292.

SANDERS (J. P.). **Treatment of Malaria by the Short Course Method.**—*Southern Med. Jl.* 1936. July. Vol. 29. No. 7. pp. 746-751. [13 refs.]

In the author's experience quinidine is superior to all other drugs tried in short courses of treatment, both in controlling acute attacks of malaria and in preventing relapses. The course consists of 10 grains, night and morning, for two days and then 10 grains for three more nights, a total of 70 grains. N. W.

SICAULT (G.) & MESSERLIN (A.). Quelques données nouvelles sur les thérapeutiques stérilisantes du paludisme. La cure continue. [**Continued Treatment of Malaria Patients.**—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 598-611.]

The authors describe the treatment of several groups of patients in Morocco with different combinations and doses of quinine, quinacrine and praequine. They found that their standard treatment was most suitable for the attack and that when this was followed by a weekly

treatment there were very few relapses. For old cases of malaria in a condition of premunition it was unnecessary to administer the initial standard treatment, because the weekly dose kept them free from attacks. The standard treatment for ordinary cases was a course consisting of 0.3 gm. of quinacrine and 0.03 gm. of praequine daily for 5 days, followed by a continuous treatment of one dose weekly. In very severe cases the initial treatment consisted of the injection of 1.6 gm. of quinine daily for the first two days, followed by three days' treatment with quinacrine and praequine. W. F.

RAGIOT (Ch.) & MOREAU (P.). Essai thérapeutique d'une nouvelle formule à base d'alkaloïdes totaux suractifs du quinquina. [A Therapeutic Trial of a New Combination of the More Active Alkaloids of Cinchona.]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Feb. Vol. 14. No. 2. pp. 199–205.

The authors followed the directions of the manufacturer and injected 1.0 cc. of the febrifuge daily. This contained 0.04 gm. (0.6 grains) of quinine and infinitesimal quantities of the other crystallizable alkaloids. As the authors remark, these doses were homoeopathic and proved too small to be of use. W. F.

SCHMUTTERMAYER (Franz). Ueber Injektionsneuritis insbesondere nach Chinininjektionen. [Injection Neuritis with Special Reference to Quinine Injections.]—*Wien. Klin. Woch.* 1936. Sept. 25. Vol. 49. No. 39. pp. 1197–1199. [22 refs.]

Two cases of neuritis following quinine injections. In the first case an injection of quinine-urethane was given into the upper arm about the middle on the external surface, therefore close to the radial nerve. The patient asserted that during the injection she had a painful burning sensation and immediately afterwards was unable to move the hand. A definite radial paralysis developed and this continued in spite of treatment. The second case received 0.5 [? .05] quinine-urethane intramuscularly into the gluteal region, the injection was given by a beginner and was introduced in proximity to the sciatic nerve. The next day the patient complained of pain in region of the injection and a dead feeling in the posterior part of the right thigh. Later signs and symptoms of sciatic neuritis developed. The author considers that quinine is a powerful protoplasmic poison with a special affinity for nerve tissue, so that when it is even in the neighbourhood of a nerve it can produce severe and frequently irreparable damage. Such cases may involve the practitioner in serious legal actions. Hence the importance in giving quinine injections to carry out the procedure strictly *secundum artem*, and, particularly, to avoid introducing the quinine in proximity to nerves. E. D. W. Greig.

DECOURT (Ph.), DUPOUX (R.), BELFORT & HENRY (Ch.). Expériences sur la prophylaxie collective du paludisme réalisées dans la région d'Oued Zerga (Tunisie) en 1935. [Mass Prophylaxis of Malaria in Tunisia.]—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 487–493.

Successful prophylaxis with 0.3 gm. quinacrine and 0.03 gm. of rhodoquine-praequine once a week.

These experiments were carried out in a highly malarious region in which the malaria was due almost entirely to subtertian infections. The authors were amazed at the rarity of gametocytes, both in subtertian and benign tertian cases. They did not find a single crescent in 1,187 cases examined. At a survey made during the healthy season, both the splenic and parasitic indices were over 70 per cent. in children. In adults the splenic index was 64 and the parasitic index 56. The carrier was *A. maculipennis*.

Nine different groups of people received nine different preliminary curative courses of treatment with quinacrine and rhodoquine-praequine, at the beginning of the malaria season, followed by treatment, once a week, with 0.3 gm. of quinacrine and 0.03 gm. of rhodoquine-praequine by the mouth. The results were very good and the malaria was controlled without antilarval work. Daily quinine prophylaxis proved a failure; people would not take it. The authors consider that the preliminary curative course is useless. [See SICAUT & MESSERLIN, above]. W. F.

ROBERT (W. Pierre). **Malaria in Children.**—*Southern Med. Jl.* 1936. July. Vol. 29. No. 7. pp. 738-742.

Some interesting remarks on malaria from the point of view of the pediatrician. Attention is directed to the abnormal clinical symptoms occasioned by malaria in infants. Reference is also made to the frequent association of pyelitis with malaria, a condition which clears up quickly under appropriate specific malaria treatment. N. W.

CHOPRA (R. N.), GANGULY (S. K.) & ROY (A. C.). **Studies on the Action of Antimalarial Remedies on Monkey Malaria. The Relationship between the Concentration of Atebrin in the Circulating Blood and Parasite Count.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 443-445.

This paper describes experiments carried out on eight monkeys, *Silenus rhesus*, infected with *Plasmodium knowlesi*. Atebrin was given either intravenously or intramuscularly. The concentration of the drug in the blood and the parasite count were determined half an hour, 2, 6, 24, 48 and 72 hours after the atebrin injection.

The highest concentration of the drug in the blood was observed within half an hour of its administration: it could not be detected in the blood 24 hours after its injection. The parasite count diminished *pari passu* with the fall in the concentration of the drug. The authors conclude that atebrin, unlike quinine, may have a direct lethal action on *P. knowlesi*: it has, however, an indirect action as well as it takes 24 hours to bring the infection under control. N. W.

CASSUTO (Nathan). Il sistema reticolo-istiocitario nella malaria delle scimmie con particolare riguardo ai fenomeni immunitari. [The Reticulo-Endothelial System and Immunity in Monkey Malaria.]—*Riv. di Malarologia.* Sez. I. 1936. Vol. 15. No. 4. pp. 240-257. With 12 figs. on 2 plates. [17 refs.] English summary.

"A series of researches with 5 monkeys infected with *P. knowlesi* are reported: 3 were infected in an acute and 2 in a chronic state; one of the latter had a latent infection and, following splenectomy, the infection of the other suffered reactivation.

"A careful and systematic examination of the reticulo-endothelial system carried out immediately upon death has shown in the 3 first monkeys a decided amount of phagocytosis with partial blocking of the R.-E.S., due to pigment. In the other 2 monkeys, instead, the multiplication of the single elements of the R.-E.S. was slight.

"These facts endorse the hypothesis according to which the R.-E.S. is partly concerned in the defence of the organism against malaria and also in establishing a consequent immunity."

SERGEANT (Et.). Un procédé simple de conservation des oeufs d'anophèles. [**A Simple Way of preserving Anopheles Eggs.**]—*Arch. Inst. Pasteur d'Algérie*. 1936. Mar. Vol. 14. No. 1. p. 23.

Spread out on a glass slide a drop of gum arabic containing 1 per cent. formalin. The eggs are arranged on the gum arabic by means of a pipette. Dry in a current of air, put on a second drop of gum and apply a cover-slip.

W. F.

ARCHIVES DE L'INSTITUT PASTEUR D'ALGÉRIE. 1936. Mar. Vol. 14. No. 1. p. 84. With 1 fig.—Technique pour le transport d'oeufs frais d'anophèles. [**The Transport of Fresh Anopheles Eggs by Post.**]

A strip of thick, dampened blotting-paper is put into a phial 7 centimetres high. The bottom of the strip rests on the bottom of the bottle; the top is fixed between the cork and the neck of the phial, so that it is immovable. One freshly fed female anopheles is put in the bottle, and the cork is luted with paraffin. The anopheles lays eggs during the journey through the post.

W. F.

ROZEBOOM (Lloyd E.). **The Rearing of *Anopheles albimanus* Wiedemann in the Laboratory.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 471–478. [2 refs.]

A. albimanus, a Central American malaria-carrier of importance, has been dealt with so faithfully by the Department of Sanitation of The Panama Canal, that at the Gorgas Memorial Laboratory, Panama, it was found advisable to resort to a system of artificial breeding when a continuous supply of adults of this mosquito was required for experiment. The technique adopted by the author is of the simplest, and the outfit costs but little.

Newly hatched larvae are placed in enamelled basins, one foot in diameter by $3\frac{1}{2}$ inches deep, or somewhat bigger, containing a dilute infusion of alfalfa hay. Such an infusion is best prepared in bulk, and removed and diluted as required; two months are needed as a minimum before it is ready for use, and its nutritive value to the larvae is enhanced by the daily addition to the liquid in the basins of a small quantity of fresh yeast, placed on a glass slide immersed just beneath the surface. In the climate of Panama, provided that the breeding basins are kept out-of-doors, protected from rain and exposed to the sun for two or three hours a day, no further regulation of temperature is necessary. Larval development requires slightly more than a week, and a basin of water should not be used much longer than a month. Pupae, to the number of 200 to 300, are collected daily or oftener, and placed in cups of clean water. The adults emerge into lamp globes, and are thence transferred to the breeding cage. Contrary

to certain races of *A. maculipennis*, *A. albimanus*, if shielded from wind and plentifully supplied with moisture, mates readily in captivity, and the author is able to keep his adults in a cage measuring $2 \times 2 \times 2$ ft. Details of the construction of the latter are given. The necessary moisture is furnished by a wet towel and an unglazed drain pipe filled with damp sand; the resultant evaporation keeps the internal temperature of the cage at between 80° and 86°F . For the reception of eggs the cage is provided with a dish ($2\frac{1}{2}$ ins. in depth) of tap water and a few cc. of well matured hay infusion; cork floats are provided as resting places for the females. Each morning the dish is removed and replaced by another, and larvae on hatching are transferred to a breeding basin by means of a pipette. In the author's laboratory, from 400 to 600 young larvae are thus dealt with each day; as in the case of other insects, overcrowding leads either to starvation and death, or to retarded development and stunting.

The males are fed in the usual manner on sugar-water or the juices of fresh fruit, while the females are given a daily meal of blood from a human arm.

E. E. Austen.

DE BUCK (A.). **Some Results of Six Years' Mosquito Infection Work.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 1-18.

An account of a simple technique for obtaining a constant supply of mosquitoes for malaria therapy and of the factors which influence the percentage of successful transmissions.

The author emphasizes the fact that in Holland, using wild caught mosquitoes during the winter and supplementing these by laboratory bred insects during the summer, an adequate supply of mosquitoes can be obtained throughout the year by very simple methods. An important practical point is that the mosquitoes can be maintained for weeks on a diet of sugar, before and after their infective feed, without the slightest unfavourable effect on the growth of oöcysts or the ripening of sporozoites. The two Dutch races of *A. maculipennis*, *atroparvus* and *messeae*, are equally susceptible to infection and no refractory individuals have been encountered. During the winter, however, *messeae* shows an apparent refractoriness due to the protracted digestion of the blood during hibernation. Striking differences in the infectivity of two strains of *P. vivax* are recorded. Of 85 patients inoculated by mosquito bite with the Dutch strain, 36 failed to develop malaria; of 159 inoculated in the same manner with the Madagascar strain, only 9 failed. The failures are ascribed to protracted incubation, and degeneration of sporozoites in the mosquito. The oöcysts are killed in mosquitoes kept for long periods (January to March) at 8° - 14°C .

V. B. Wigglesworth.

VOLLMER (Ortrud). Ueber *Anopheles maculipennis*-Dauerzucht und einige Zuchtversuche. [**Continuous Breeding of *A. maculipennis*.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Aug. Vol. 40. No. 8. pp. 342-352. With 1 fig.

An account of methods used for maintaining a stock of *Anopheles maculipennis* race *atroparvus* for malaria therapy.

The larvae were kept in large bowls containing freshly cut sods of living grass in rain water. The adults were kept in roomy gauze cages and fed on a young pig. Freshly caught adults of the same race

were introduced from time to time to prevent any possible degeneration from inbreeding. Attempts to rear *A. maculipennis* race *messeae*, *A. elutus* and *A. bifurcatus* by the same methods were unsuccessful.

V. B. Wigglesworth.

SERGEANT (Etienne). Note sur les oeufs d'anophèles d'eaux saumâtres du littoral algérien. [**Anopheles Eggs on Brackish Water in the Algerian Littoral.**—*Arch. Inst. Pasteur d'Algérie*. 1936. June. Vol. 14. No. 2. pp. 109–118. With 19 figs. (15 on 7 plates.)

The scene of the studies here described was formed by the mouths of two small wadis, respectively communicating with the sea some twenty and twenty-five miles to the east of Algiers. By far the majority of the Anopheles here met with are *A. maculipennis* var. *labranchiae*, the larvae of which swarm in water containing from 6 to 9 grams of salt per litre, but disappear when the salt content per litre reaches 10 grams. With regard to eggs, so many intermediate types were found between those of vars. *labranchiae* and *sicaulii* as more or less to obliterate the right of the latter to a distinctive designation. Despite favourable conditions supplied by brackish water, *A. elutus* was not encountered, and, among more than 3,000 eggs, there was only one batch belonging to the var. *melanoon*. Photographs are given showing structural peculiarities of the eggs of *A. claviger* (*A. bifurcatus*, in 1934 and 1935 obtained only in October and November, and then but seldom), *A. m. labranchiae* and *A. m. melanoon*. It is interesting to note that what are here styled top-minnows ("gambouses"), but whose identity is not more precisely indicated, destroyers of Anopheles in both egg and larval stages, flourish in water saltier than the sea (26 gm. of NaCl per litre). E. E. A.

SWELLENGREBEL (N. H.), DE BUCK (A.), KRAAN (M. H.) & VAN DER TORREN (G.). Occurrence in Fresh and Brackish Water of the Larvae of "*A. maculipennis atroparvus*" and "*messeae*" in Some Coastal Provinces of the Netherlands.—*Quarterly Bull. Health Organisation. League of Nations*. Geneva. 1936. June. Vol. 5. No. 2. pp. 280–294. With 3 diagrams & 2 maps.

Previous investigations by the authors had shown that adults of *A. m. atroparvus* were most numerous in the coastal provinces of the Netherlands, except in South Holland where adults of *A. m. messeae* outnumbered the others. Data, albeit incomplete, indicated that surface water in the non-malarious province of South Holland is much less saline than that in the other coastal provinces, whence the natural deduction follows that the larvae of *messeae* prefer fresh and those of *atroparvus* brackish water. In view of the fact that findings in Germany and elsewhere prove that *A. m. atroparvus* "is by no means confined to brackish water in its larval stage," it was considered advisable "to settle this point in the coastal area of the Netherlands." The region covered by the authors' studies, which were continued during three breeding seasons, amounted to some 2,850 square miles, and included 907 breeding places, in South and North Holland, the delta islands and an inland area. Since there was no certainty that eggs found on any particular water would eventually give rise to adults, identification had to be made from full-grown larvae, whereof no fewer than 24,260 were examined. The characters, duly tested as regards reliability,

used in determination are described, and the results are summarized by means of maps, table and diagram. While "*Atroparvus* larvae are not limited to brackish water (mesohaline water of the hydrobiologists, with a chlorine content of 1,000 milligrammes per litre or more)," and this race even breeds "in completely fresh water (chlorine content under 100 milligrammes)," "its larval density in fresh water is less than 2 per cent. of that in brackish water." On the other hand, "messeae's preference for water of a low salinity is not so well marked as *atroparvus*'s preference for water of a high salinity." As regards "the occurrence of a decided majority of *atroparvus* larvae in perfectly fresh water along the eastern boundary of the inland area," it is suggested that "*atroparvus* larvae succeed in occupying breeding-places uncongenial to their needs, and in suppressing messeae, so long as they are supported by a vast majority of their own kind in the surrounding or adjacent breeding-area."

E. E. A.

GEBERT (S.). **The Breeding of *Anopheles costalis* in Sea-Water, in Mauritius.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 255-257. With 2 figs.

The finding by the author of larvae of *A. gambiae* (*A. costalis*) in strongly brackish pools, wherein the insect breeds from year to year, led him to test their ability to exist in pure sea-water. When eighteen first instar larvae were removed to the laboratory from water containing 12.27 grams of NaCl per litre, and placed in sea-water of which the NaCl content was 24.55 grams per litre, six larvae died in the first five days, and four others three days later; the remaining eight larvae developed normally, pupated in from eighteen to twenty days, and yielded perfect adults at the end of a pupal stage which lasted for four days. By this time, owing to evaporation, the water in the container had diminished by about one-half, and its NaCl content per litre was found to be 46.77 grams, *i.e.*, it was nearly twice as salt as ordinary sea-water. First instar larvae, from pools in which the NaCl content was respectively 3.21 and 4.36 grams per litre, when placed in the foregoing concentration, perished within three days. Eight eggs taken from the breeding-ground to the laboratory, and there placed in sea-water, after three days yielded seven larvae, of which four died before the second instar, while the remainder pupated in sixteen days, and eventually produced adults of normal size.

After pointing out the difficulties and disadvantages under which the experiments were conducted, including a twelve-mile transit from breeding-ground to laboratory, the author concludes that the results show that *A. gambiae* is little affected by changes of environment, and may possibly be able "to live not only in ordinary sea-water, but also, perhaps occasionally, in the more concentrated sea-water in salt pans."

E. E. A.

DE MEILLON (Botha). **The Distribution of *Anopheles gambiae* and *A. funestus* in Natal.**—*Publications of South African Inst. Med. Res.* 1936. Apr. Vol. 7. No. 38. pp. 133-135. With 1 map.

Climatic conditions are suitable for *A. gambiae* and *A. funestus* throughout the province of Natal. In normal years, however, the distribution of *A. gambiae* is restricted by vegetation, which shades otherwise suitable breeding places, and by the mountainous and hilly

nature of the country which normally prevents the formation of suitable *gambiae* breeding pools. Prolonged drought, denuding the vegetation, followed by midsummer rains, might cause much increased *gambiae* breeding; this is thought to have occurred in 1931-32 and to have been a factor in the causation of the malaria epidemic of that year.

A. funestus has a very restricted distribution: the small streams are constantly flushed and the large rivers have sandy beds and banks with very little vegetation. Such conditions are unfavourable for *funestus*.
N. W.

CATANEI (A.). Sur les gîtes à larves d'anophèles des lacs de Savoie.

[**Anopheline Larvae and the Lake of Savoy.**]—*Arch. Inst. Pasteur d'Algérie*. 1936. Mar. Vol. 14. No. 1. pp. 18-22. With 6 figs. on 2 plates.

The author has searched the great lakes, such as the Lake of Geneva, L. Bourget, L. St. Andre, and L. Annecy and he has found them free from larvae; the action of the wind produces too much disturbance of the surface. In the smaller lakes too, Anopheles are scanty or absent. *A. maculipennis* and *A. bifurcatus*, are nevertheless widely distributed in the district, and their breeding places are small collections of water behind the banks of the lakes, behind the masonry walls of landing-places and the like.
W. F.

WATSON (Robert B.). **Some Preliminary Observations on Airplane Dusting for Anopheles Larvae Control.**—*Southern Med. Jl.* 1936. Aug. Vol. 29. No. 8. pp. 862-867. With 5 figs.

When the General Joe Wheeler Dam in the Tennessee valley is closed in October the lake that will be formed will have a shoreline of 950 miles: many hundred acres of the lake will have a depth of water of less than three feet. It is possible that *Anopheles quadrimaculatus* may breed in abundance. In anticipation of such an eventuality experiments have been carried out with airplane dusting in conditions similar to those that are expected to arise. The dust used in the experiments was Paris green and powdered soapstone—11 to 12.5 per cent. of the former. Taking twenty particles of Paris green per square inch as the minimum effective concentration, the effective dust path, flying at 50 feet, was found to be 520 feet wide.

Tortuous shoreline dusting did not give results commensurate with the risks involved: this type of flying is very dangerous. The reduction in larvae varied between 13.7 and 62 per cent. Over a small spring-fed natural lake and swamp, however, the results were much more encouraging. Under poor conditions, with a wind velocity of ten miles an hour, a 94 per cent. reduction of larvae was obtained in the open lake, 98 per cent. reduction in densely vegetated swamp land and 79 per cent. reduction in the densely wooded area. The cost, using a 10 per cent. by volume Paris green dust, was 1.22 dollars per acre, as compared with 2.20 dollars for hand and boat dusting and 2.28 dollars for oiling.
N. W.

SCHARFF (J. W.). **Filling Tree-Holes: an Anti-Mosquito Measure.**—*Malayan Med. Jl.* 1936. Mar. Vol. 11. No. 1. p. 58.

"Regular and systematic tree-hole filling has been one of the many factors in the almost complete abolition of mosquitoes in Penang."

The holes must be carefully cleaned out and all dead wood removed. When clean, a strong disinfectant, 25 per cent. Agrisol, is brushed on. The hole is then carefully filled with a mixture of coal-tar and granite chips of putty-like consistency (not hot). A coating of an asphalt preparation, known as Colas, is run over the top to make the stopping water-tight.

W. F.

BOYD (Mark F.) & KITCHEN (S. F.). **Is the Acquired Homologous Immunity to *P. vivax* Equally Effective against Sporozoites and Trophozoites?**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 317-322.

The experiments described indicate that the mechanism of the homologous immunity acquired on recovery from a *P. vivax* infection is operative against the trophozoite stage of the parasites, but not against sporozoites. It is acquired regardless of whether the attack is artificially induced (by introduced trophozoites) or naturally induced (by introduced sporozoites). In whichever way the primary attack is induced it does not appear that the immune mechanism is capable of dealing with subsequently introduced homologous sporozoites, as some at least of these cells survive to produce the trophozoites of a sub-clinical infection.

W. F.

SPRUE.

AUGIER (A.) & AUGIER (P.). La sprue.—Congrès des Colites Plombières-les-Bains 1935. [**Sprue. Congress on Colitis held at Plombières-les-Bains, 1935.**—18 pp. 1935. Compagnie des Thermes de Plombières-les-Bains (Vosges).]

This is a Congress paper on Sprue sketching the symptomatology, views regarding the aetiology and the suggested modes of treatment since the beginning of the present century. It contains no fresh information.
H. H. S.

TOULLEC. La sprue. [**Sprue.**—*Bull. Soc. Méd.-Chirurg. Indochine.* 1935. Nov. Vol. 13. No. 9. pp. 1247-1255. [13 refs.]

This is a general account of sprue, reviewing some of the theories as to its aetiology and including remarks on the chief indications for treatment, but the more modern methods of the last 3-4 years have not been included.
H. H. S.

MAURITIUS, COLONY OF: ANNUAL REPORT ON THE MEDICAL AND HEALTH DEPARTMENT, 1ST JANUARY TO 31ST DECEMBER, 1934 [KIRK (J. Balfour), Director]. Appendix I. pp. 40-41.—**Sprue** [ADAMS (A. R. D.), Senior Pathologist].

The provisional diagnosis of a case of what was thought to be indigenous sprue, mentioned in the medical report for 1933, was subsequently confirmed. Yet another case has been observed in 1934. The patient was a local man, of Creole descent, with a history of 8 months' illness and presenting the typical signs of sprue and a drop in weight from 140 to 60 lbs. He improved steadily on a milk régime.

Another case is briefly referred to, but is not on all fours with the others, for the patient was a European, a ship's carpenter landed at Mauritius already suffering from the disease.
H. H. S.

SNIJERS (E. P.). Over een merkwaardig geval van tropische spruw.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1936. June 30. Vol. 76. No. 26. pp. 1602-1618. With 2 figs.

REED (Alfred C.). **Sprue—a Clinical Summary.**—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 499-526. [45 refs.]

This article is, in the opinion of the reviewer, one of the best general clinical summaries of sprue he has met with of late. Not only is the clinical aspect dealt with in detail, with 9 case records illustrating various points in the symptomatology and treatment, but the aetiological side is also discussed and the morbid anatomy (or the absence of any characteristic changes).

[In one important point our experience differs from that of the author, *viz.*, in his statement "Tetany is not at all common in sprue." On the contrary we have frequently seen it in chronic cases, and most cases of sprue are chronic, with a low blood calcium and, short of tetany, cramps in the calves and elsewhere are frequently complained of. The author continues: "Its association with deficient blood calcium led SCOTT to postulate his theory of parathyroid lesions but

FAIRLEY and others have found no lesions in the parathyroids in sprue." This error has crept into the literature and, as a noted professor has stated, "it takes ten years to get a fact into the literature, but if the statement is wrong it takes a lifetime to get it removed." Hence indulgence is asked for the following apologia. SCOTT postulated *functional* disturbance of the parathyroids, basing the theory on the fact that the giving of parathyroid in many cases brought about an almost immediate amelioration and that when the deficient action had received support for a time the gland would assume its proper functions again. Under such circumstances no lesion, none, that is, demonstrable by ordinary pathological procedure, would be seen, nor, according to SCOTT's view, is it to be expected. Rarely, if ever, is a functional disturbance demonstrable by pathological change. It may be, it is true, but it does not necessarily follow that: "It must therefore be assumed that insufficient absorption of calcium from the intestine is at fault." Sprue may exist with a total blood calcium little below normal, but its distribution, its metabolism, its regulation by the parathyroids may be at fault, their function being temporarily in abeyance. The "ionic" calcium is deficient, and the "coagulative" in relative excess, under such conditions, though the total is within normal limits, the symptoms of sprue may occur. (See this *Bulletin*, 1923, Vol. 20, p. 733; 1924, Vol. 21, p. 43; 361; 1925, Vol. 22, p. 32; 760; 761.) The article is well documented. H. H. S.

MEIRA (João Alves). Considerações diagnosticas sobre um caso de esprú.— Reprinted from *Rev. Assoc. Paulista de Med.* 1936. July. Vol. 9. No. 1. With 4 charts. [65 refs.]

HANES (Frederic M.) & MCBRYDE (Angus). **Identity of Sprue, Nontropical Sprue and Cellac Disease.**—*Arch. Intern. Med.* 1936. July. Vol. 58. No. 1. pp. 1-16. With 3 figs. [29 refs.]

The discussion in this article, which is of the utmost interest to those who meet with cases of sprue in the tropics or at home, and also to those whose practice lies amongst children, is based on nine cases presenting the symptoms of sprue, the ages ranging between 27 months and 60 years. In a terminal note the authors state that they have since had under observation five more patients, one an adolescent of 17 years, the others adults. Brief notes are given of seven and fuller accounts of two. The symptoms, physical signs, and biochemical analyses were all typical, except that in no case, in spite of the low calcium content of the blood, is mention made of cramps or tetany. All showed low sugar curves, eight had marked steatorrhoea (the other's stools were not chemically analysed); the same number had macrocytic anaemia, and free HCl was found after histamine, and in all the response to liver extract was prompt and satisfactory.

The authors agree strongly with the opinions of THAYSEN that coeliac disease of children, ideopathic steatorrhoea of adults in temperate climates and sprue of the tropics are fundamentally identical. "Infantile sprue and adult sprue . . . bear the same relationship to each other as do cretinism and myxoedema." The osteoporosis of the child has its analogue in osteomalacia in the adult, and the low blood calcium and phosphorus, the type of anaemia, the aphthous stomatitis, xerophthalmia and nyctalopia are changes recognizably due to

avitaminosis [but xerophthalmia and night-blindness are not common in tropical sprue ; at all events, the reviewer has never met with it. Moreover, it is not safe to lay too much stress on similarity or even identity of individual symptoms as indicative of a single cause]. The article is clear and well documented and should be read *in extenso* by all interested in this subject.

H. H. S.

SNELL (Albert M.). **Clinical Observations on Nontropical Sprue.**—*Arch. Intern. Med.* 1936. May. Vol. 57. No. 5. pp. 837–856. With 3 charts. [34 refs.]

The author describes and comments upon ten cases of "non-tropical sprue" observed by him at the Mayo Clinic. Nine came from the North Central States; one from Texas. Two had been born in Northern Europe but had spent their adult life in the U.S.A. None gave any history of living in the tropics. The clinical features were typical: steatorrhoea, gastro-intestinal disturbance, loss of weight, defective metabolism of Ca and P, with, in some cases, tetany and osteoporosis, and anaemia with pallor. The disease had existed, or the symptoms had been present, on and off for periods ranging between 15 months and over 20 years. Some clinical details and the results of the biochemical examinations are given in tables. These are discussed in the text and are of the usual characters seen in this disease. It is stated that "the urinary excretion of calcium is low but the faecal excretion of calcium is increased" [but is it not more accurate to account for both these by defective absorption?] During the periods of improvement the author noted that the serum calcium values gradually increased [this fact and the value of it in prognosis was pointed out by the reviewer 12 years ago, see this *Bulletin*, 1924, Vol. 21, p. 361]. The questions of pathogenicity and treatment are briefly touched upon and discussed. Three of the patients, two women and one man, died; one of intercurrent respiratory disease, one with symptoms of an aplastic type of anaemia and one "died of a hemorrhagic disorder of unknown etiology suggesting acute leukemia," but in the table the blood findings given for this patient are total leucocytes only 5,600 per cmm. and red cells 7,790,000 [!].

H. H. S.

THAYSEN (Th. E. Hess). **Ten Cases of Idiopathic Steatorrhoea.**—Reprinted from *Quarterly Jl. Med.* 1935. Oct. N.S. Vol. 4. No. 16. pp. 359–395. With 5 figs. on 1 plate. [61 refs.]

The detailed account of the ten cases referred to in the title of this article is preceded by a soundly reasoned discussion of the relations between coeliac disease, non-tropical and tropical sprue. In his preliminary remarks the author notes that "the only means we possess of establishing the differential diagnosis between pancreatic and idiopathic steatorrhoea, in cases with a normal blood-sugar curve, is the estimation of the nitrogen excretion in the faeces, which is increased to a considerable degree in steatorrhoea of pancreatic origin." It is not generally known that in this latter condition we may find normal blood-sugar curves and upset of calcium metabolism with tetany.

A table gives the presence or absence of certain symptoms in the ten cases discussed, notably steatorrhoea, stomatitis, anaemia and the form

of it, the blood-sugar curve, basal metabolism per cent. and the pigmentation. Six were cases of non-tropical sprue, one of tropical sprue and three of coeliac disease. Professor Thaysen's main thesis is that the central clinical feature—the metabolic disturbances—are characterized by: (1) Abnormal excretion of fat in the faeces; (2) Normal or slightly increased excretion of nitrogen; (3) A flat blood-sugar chart; and (4) Increase in basal metabolism. As a result of his analyses he infers that the steatorrhoea is due to diminished fat absorption and not to excessive excretion of fat by the bowel. As regards nitrogen excretion, in tropical sprue this is about 3 gm. in 24 hours, in non-tropical it varies between less than 1 gm. to 2.9 or even 3.6 (recorded by HOLST, see this *Bulletin*, 1928, Vol. 25, p. 57), *i.e.*, normal or slightly raised. To maintain nitrogenous equilibrium, therefore, a relatively high intake is necessary. The flat blood-sugar "curve" need not be stressed; it was observed in all ten cases, and others have demonstrated it in coeliac disease. On the other hand it is not found in other types of fat-diarrhoea and its existence in coeliac disease and sprue, tropical and non-tropical alike, lends support to the author's view of their identity. There is little doubt that this is due to disturbance of blood-sugar regulation and not to diminished absorption, as shown by the effect of oral or intravenous administration of glucose. Those of the ten whose basal metabolism was about normal were in a fairly good state at the time of the test. One patient, during a bad period, had an increased rate of 125 per cent., but when he had improved, 9 months later, it was normal 103.4 per cent. Disordered calcium metabolism, with changes in phosphorus metabolism was found in all the groups, but, of course, as is well known, this condition occurs in conditions other than idiopathic steatorrhoea. "A daily intake of 2.5 gm. CaO does not always ensure a sufficient resorption in cases with marked steatorrhoea" and to effect this it is all important to give sufficient calcium, phosphorus and ergosterol.

Among 45 cases of non-tropical and 180 of tropical sprue, some 60–70 per cent. had hyperchromic anaemia. In coeliac disease the hypochromic type is commoner, but this, says Professor Thaysen, does not "signify any fundamental difference between coeliac disease and sprue, but rather the expression of a special reaction on the part of the juvenile organism The occurrence of hyperchromic anaemia in children is recognized to be extremely rare." The author has also shown previously that hyperchromic anaemia though untreated may pass into a hypochromic form in a good period and *vice versa*; it is thought that the former (hyperchromic) is due to deficient absorption of some "extrinsic factor", hence the alternation in good and bad periods. Pigmentation may resemble that of pellagra (but without keratosis) and is regarded as due to B-avitaminosis. Glossitis is as frequent in non-tropical as in tropical sprue.

The avitaminosis question is discussed. Since absorption of vitamin A depends on the fat content of the bowel, the infantilism accompanying coeliac disease may arise from deficiency of this vitamin; abnormal calcium metabolism is known to result from deficiency of D, and this symptom (see above) occurs in coeliac disease and in both tropical and non-tropical sprue. B-vitamin deficiency has already been mentioned. Lastly, the megacolon may be present in all three. The author suggests that the primary cause is atony from altered innervation—low blood pressure and lowered vagotonus—then stasis of faeces and further gaseous distension.

These are some of the many points discussed in the article ; for further details the original article must be consulted. H. H. S.

MOGENSEN (Erik). Tre Tilfaelde af idiopatisk Steatorré (Gee-Thaysens Sygdom). [**Three Cases of Idopathic Steatorrhoea (Gee-Thaysen's Disease).**].—*Hospitalstidende*. 1936. Oct. 6. Vol. 79. No. 40. pp. 1032-1053. With 5 figs. [33 refs.]

The late T. E. HESS-THAYSEN applied the term idiopathic steatorrhoea to all three manifestations (coeliac disease, tropical and non-tropical sprue) of what he considered one and the same disease. His conclusions were embodied in the monograph he published in English in 1932 ; "Non-Tropical Sprue." [See this *Bulletin*, 1933, Vol. 30, p. 57]. His labours in this field and his success—disputed in England but acknowledged in other quarters—warrants, in the opinion of Mogensen, the employment of the term Gee-Thaysen's Disease as a synonym for idiopathic steatorrhoea.

One of Mogensen's cases was that of a married woman, aged 27, who had never been in the tropics, and who had been perfectly well throughout her childhood during which she had suffered from no intestinal complaint. Half way through pregnancy, her stools became frequent and light-coloured. Severe anaemia, pigmentation of the face and aphthous stomatitis developed. After a normal confinement and puerperium, typical idiopathic steatorrhoea developed, with a flat blood-sugar curve, meteorism, pigmentation and aphthous stomatitis. Great improvement was effected on a diet poor in fats and rich in vitamins. The second patient was a man, aged 74, whose steatorrhoea was complicated by a hyperchromic, megalocytic anaemia which dominated the clinical picture. Though he had been in the tropics 20 years earlier, the case should be regarded as one of non-tropical sprue. The third patient was a woman, aged 38, whose idiopathic steatorrhoea had begun when she was 8 years old. She had a low blood-sugar curve after both the intravenous and the oral administration of glucose—a point supporting Hess-Thaysen's observation that a low blood-sugar curve is not due to faulty absorption of glucose.

C. Lillingston.

BEINS (Ch. A. G.) & LOTTGERING (A. B.). Een geval van inheemsche spruw met huidafwijkingen. [**A Case of Non-Tropical Sprue with Skin Symptoms.**].—*Nederl. Tijdschr. v. Geneesk.* 1935. Dec. 14. Vol. 79. No. 50. pp. 5739-5743. With 2 figs. on 1 plate. [14 refs.] English summary (3 lines).

Such a case as the one described had to be distinguished from "coeliac disease," pancreatogenic fat diarrhoea and even from pellagra. The patient, who was 42 years of age, had suffered for two years from an eruption and itching. The eruption, which was not symmetrical and had not the localization of pellagra, had begun on the back of one knee and spread over arms, legs and buttocks. It was brownish red in colour and scaly. The faeces were not formed, stuck to the vessel, were of pulpy consistence, putty-coloured, somewhat frothy, had a strong acid smell and contained numerous fat crystals. A blood macrocytosis appeared to be present. Blood sugar and other

blood tests were made. The cholesterolin content of the blood serum was 132 mgm. per cent. and the calcium content 11.5 mgm. per cent. Absence of tetany, and of the low calcium content which goes with it, were probably due to the fact that fat diarrhoea had not been present for very long. A skin eruption is not a common accompaniment of sprue, but enterogenic eruptions, cases of secondary pellagra (pellagroid), are being described in deficiency diseases and are attributed to chronic gastrointestinal disturbance. It was the result of treatment which gave conclusive support to the diagnosis. Treatment, besides being dietetic, included the use of marmite but consisted mainly of intramuscular-injections of liver extract. It was successful to the extent of causing the disappearance of the sprue symptoms and a great improvement in the skin condition.

W. F. Harvey.

FULLERTON (Harold W.) & INNES (J. Alexander). **Case of Idiopathic Steatorrhoea with Multiple Nutritional Deficiencies.**—*Lancet*. 1936. Oct. 3. pp. 790–792. [10 refs.]

The authors place this case on record because, in addition to some of the signs of ideopathic steatorrhoea ("non-tropical sprue"), there were indications of vitamin and mineral deficiencies.

A woman, 29 years of age, had suffered for some two months from spasmodic movements of the muscles of the face, trunk and limbs, attacks lasting for about five hours. She had suffered from mild diarrhoea since early infancy, 2 or 3 motions daily, but for the last 6 months up to 10 a day. They were said to be loose and light in colour [but in spite of her being in hospital for this condition on three occasions for 5 and 4 weeks on the first two, no description of the stools is given, but analysis showed the ratio of neutral fats to fatty acids to be 1 : 2.5]. She had lost weight, 2 stone "during the previous few months" [it would seem that no more definite statement on this was obtained]. She was pale, thin and undergrown, showed on admission symptoms of tetany; serum calcium low, 7.1 mgm. per cent. the day before admission, 6 mgm. six days later, 9 mgm. after another fortnight. Erythrocytes about 3 million, Hb 65–67 per cent., complete achlorhydria by fractional gruel test-meal [no record is made of the giving of histamine]. She was discharged improved 5½ weeks after admission. Nearly two years later she was readmitted, having shown similar symptoms, and in two days ecchymoses appeared on arms and legs, purpuric eruption on the thighs, and a painful swelling [? haemarthrosis] of the right elbow, red cells 2,440,000, white 8,400 per cmm., Hb 52 per cent., platelets about normal, serum-calcium 5.2 mgm. per 100 cc. She was given liver and a blood transfusion, with some improvement. She left at her own request after 4 weeks in hospital, but less than a month later was readmitted with pain in the throat, hoarseness, sore tongue, swelling of legs, and a day or two later a cough without much expectoration. The blood condition was better; red cells 4,200,000, white 14,750 (3 days later 8,400), Hb 70 per cent. In spite of treatment with iron, campolon, marmite, calcium lactate, radiostoleum and orange juice, the patient died a week after admission.

The authors are of opinion that the patient had suffered from coeliac disease as a child and that the late symptoms are ascribable to deficiency, of vitamins B₂ and C, and perhaps A, B₁, D and E also, and of calcium, iron and the "anti-anaemic factor."

H. H. S.

KONSTAM (Geoffrey) & GORDON (Hugh). **Idiopathic Steatorrhoea with Skin Lesions and Megalocytic Anaemia.**—*Proc. Roy. Soc. Med.* 1936. Apr. Vol. 29. No. 6. pp. 629–631 (Clinical Sect. pp. 23–25). With 1 coloured plate.

——. **Idiopathic Steatorrhoea with Osteoporosis, Tetany and Megalocytic Anaemia.**—*Ibid.* pp. 631–633 (Clinical Sect. pp. 25–27). With 2 figs.

These cases are referred to here because idiopathic steatorrhoea has by some authors been designated non-tropical sprue. In both there were some of the symptoms of sprue, reduction of serum calcium, a mild degree of anaemia of the macrocytic type; in one there was diarrhoea with large pale stools, in the other constipation with occasional periods of diarrhoea, both were wasted and pale; the stools showed excess of total fat and relative preponderance of free fatty acids. In the first patient there were patches of pigmentation on the chest, pigmentation with dryness and cracking of skin over the anterior aspect of both legs and pigmented patches with lichenification over the dorsum of each foot. There was a good deal of pruritus. Pellagra was suggested but the sites of the pigmentation differed from those affected in this disease. Neither patient had been in the tropics. Improvement followed the administration of calcium and vitamin D, but liver therapy was disappointing.

H. H. S.

WEIR (James F.) & ADAMS (Mildred). **Idiopathic Steatorrhea. Metabolic Study of a Patient, with Reference to the Utilization of Nitrogen and Fat.**—*Arch. Intern. Med.* 1935. Dec. Vol. 56. No. 6. pp. 1109–1116.

The patient was a white man of 26 years with no history of having visited the tropics. He was undersized and according to his history he had grown little since the age of fifteen years. During the past 10 years he had had recurring attacks of anorexia, diarrhoea, flatulence and fatigue, with loss of weight. Four or five stools were passed daily, the first two or three bulky and grey, the others watery. The attack preceding his coming to hospital had begun five months before and he showed signs of subacute combined sclerosis—numbness and tingling in hands and feet and some inco-ordination. He was weak, pale, showed some oedema, clubbed fingers and a doughy distended abdomen. He had had a glossitis and stomatitis 2 years before. Blood examination showed Hb 10.3 gm. per 100 cc. (62 per cent.), red corpuscles 2,580,000, white 2,700 per cmm. The anaemia was of the macrocytic type, but though "the blood smear presented the picture of pernicious anaemia" there is no mention of any erythroblasts. Gastric analysis gave total acidity 38 and free HCl=22 cc. decinormal NaOH. Serum-calcium was down to 7.8 mgm. per cent., phosphorus 3.4 mgm.

Treatment by diet low in fat, high in protein, with calcium lactate 1 drachm three times a day, and viosterol and liver extract, resulted in disappearance of symptoms; the weight increased, stools were normal, twice daily, no oedema. Blood had improved: Hb. 12.9 gm. (77 per cent.), red corpuscles 4,320,000, white 5,100 per cmm., some hypochromia but "not . . . the features of pernicious anaemia . . . previously present." Protocols show the intake of nitrogen, fat, etc., and the results of faecal analyses. It is seen that the patient had a

low tolerance for fat; increase of intake increased the output and a low intake relieved the gastro-intestinal symptoms and reduced the number of stools.

H. H. S.

LAWOETZ (B.) & VOGT-MØLLER (P.). Studier over Fedtstofskiftet. II. Fortsatte Undersøgelser over Haemolipokrit-Metodens Anvendelighed og over Hyperlipaemiens Fysiologi samt Pathologi ved forskellige Sygdomme, navnlig ved idiopatisk Steatorrhoe (Sprue, ikke-tropisk Sprue, intestinal Infantilisme). [**Studies of Fat Metabolism. II. Further Investigations of the Applicability of the Haemolipokrit Method, and of the Physiology of Hyperlipaemia and its Pathology in Various Diseases, Notably in Idiopathic Steatorrhoea (Sprue, Non-Tropical Sprue, Intestinal Infantilism).**]—*Hospitals Tidende*. 1936. Oct. 6. Vol. 79. No. 40. pp. 1009–1031. With 1 chart. [27 refs.] German summary.

In an earlier publication appearing in 1934, the authors gave a detailed account of the haemolipokrit method, devised by Rückert, and they discussed its application to the determination of the lipoids in serum. Their present publication brings their studies in this field up to date, and deals with the exploitation of this method by the clinician. They have found that this method provides an easy and sure means of determining the fatty contents of the serum with the exception of free cholesterin. Though it is not yet clear whether the method can be so modified that it can be relied on to assure fractional determinations of the fatty contents of serum, it is assuredly a great advance on earlier methods, and it should do much to throw new light on the physiology and pathology of fat metabolism.

With regard to the possibility of the lipoids in the blood in the fasting state being kept within such uniform limits that a divergence therefrom can be considered as pathological by a single test, the authors are sceptical, having found the range of variation too wide. The lipid content of the serum of 10 patients suffering from idiopathic steatorrhoea was measured, and in the severe cases it was found far below the normal fasting limit. In the light forms of the disease, however, the lipid content of the serum was low, but still within normal limits. It would seem from these and other investigations that the steatorrhoea of sprue is due to diminished fat resorption. The authors' investigations were also extended to cases of pancreatogen steatorrhoea, jaundice from mechanical causes, cirrhosis of the liver and chronic nephrosis.

C. Lillingston.

LUDWIG (H.). Zur Pathogenese und Therapie der nichttropischen Sprue. [**Pathogenesis and Treatment of Non-tropical Sprue.**]—*Schweiz. Med. Woch.* 1936. May 16. Vol. 66. No. 20. pp. 473–477. With 2 figs. [29 refs.]

The author describes two cases of the poorly-differentiated condition denominated non-tropical sprue. Both were males, one of 40 years, the other 48 years. The former had no soreness of the tongue but he presented symptoms of tetany, Trousseau's and Chvostek's signs positive, serum calcium 5.04 mgm. per cent., fatty stools, deficiency in gastric HCl, but no blood changes of any moment—red corpuscles 4.9 million, haemoglobin 95 per cent. Within 3 months he put on 7.5 kgm. and the serum Ca rose to 14.2 mgm. No details of the treatment of this patient are given, though there is the statement that

adrenal cortex extract was ineffectual. He was kept in bed, given a mixed diet with calcium Sandoz.

The second patient had more typical symptoms: sore tongue, wasting, osteoporosis, marked anaemia—red cells 1.28 million per cmm., haemoglobin 30 per cent., colour index 1.2, stools 4–6 in the early morning, serum calcium 7.2 mgm. per cent. He improved greatly from injections of campolon; in 7 weeks erythrocytes were 4.3 million and serum calcium 10.8. The results of the faecal analyses do not show much change; at the beginning of treatment neutral fats were 37.9 per cent. and free fatty acids 41.8 and 6 weeks later the figures were 37.4 and 51.4 per cent. respectively. [The title hardly describes the contents of this article; not much is said regarding treatment, and nothing on pathogenesis.] H. H. S.

DAHR (Peter) & HAGEMANN (Paul). Zur Bedeutung der Bakterien- und Pilzbefunde bei Sprue. Sammelbericht an Hand eines bakteriologisch untersuchten Falles einheimischer Sprue. [**The Significance of Bacteria and Moulds in Sprue.**—*Giorn. di Batteriol. e Immunol.* 1936. Aug. Vol. 17. No. 2. 39 pp. [160 refs.]

A review of the literature which has been published and opinions which have been expressed during the past quarter of a century, with even earlier references, on the question of the part played by bacteria and moulds in the aetiology of sprue. It is interesting and useful to have these points brought together, but apart from this the information has no longer any but historical value. In the same connexion the authors record the case of a woman of 30 years who developed sprue-like symptoms in Cologne though she had never been outside Germany. They found a "yeast-like mould" in the stools, the saliva, scrapings from the tongue, in the duodenal secretion and in the vagina, but conclude that it was a fortuitous contamination, having no aetiological connexion with the condition, which they think "is very likely a form of avitaminosis." H. H. S.

SUAREZ (Ramon M.). **Hematological Studies in Sprue.**—*Bol. Asoc. Med. de Puerto Rico.* 1935. Oct. Vol. 27. No. 10. pp. 239–249. With 10 charts. [20 refs.]

Dr. Suarez, who has done much work on the haematology of sprue, here gives an analytical account of 25 typical cases from the haematological aspect. During a period of 8 weeks they were on a special sprue diet and for the first two weeks were receiving 10 cc. daily, or on alternate days, and of 2 cc. daily for six weeks, of a preparation of Lilly's, on which 1 cc. is equivalent to 5 gm. raw liver.

His technique is described. He extracted 5 cc. of blood by venepuncture into a bottle containing 10 mgm. potassium oxalate. Haemoglobin was determined by Sahli's method, in which 100 per cent. corresponds to 14.5 gm. In interpreting haematocrit results he took as normal for men 5 million red cells and 42 as the volume of packed cells, and for women 4.5 and 41 respectively, these figures being those obtained from a study of 50 adults, apparently in good health.

In his analysis of cases Dr. Suarez notes an almost constant increase in the volume of the packed red corpuscles from the beginning of treatment. Two of three which did not conform with this were suffering also from ankylostomiasis. In 21 there was a reticulocyte response of

over 7 per cent., *i.e.*, more than four-fifths responded with a reticulocytosis to parenteral administration of liver extract. It was interesting to find that the higher mean cell haemoglobin concentrations tended to fall and the low concentrations to rise as treatment progressed, so that the averages of Hb concentration at the beginning (30·8 per cent.) were almost the same as that at the end of the investigation (30·3).

Returning to the subject of reticulocyte response, the highest average response at the end of a week was 10·5 per cent. ; it varied between 0 and 42. An increase of reticulocytes in the blood stream was observed usually 3-4 days after starting injections of liver extract, reaching a peak in 5-9 days, and becoming normal again in the third to fourth week. Mention is made of the fact that in sprue (unless the initial red cell count is under 1 or over 3 millions per cmm.) as in pernicious anaemia, in spite of a reticulocyte response there is no red cell increase observed during the first week of treatment, although there is increase in the volume of packed cells and steady rise in haemoglobin. The increase in packed cell volume is not due to leucocyte increase, and there must be, therefore, a relative diminution in plasma. The author suggests in explanation of the apparent anomaly, that the reticulocytes "are dissolved or haemolysed in the diluting fluid." In one case charted the reticulocyte response was nearly 65 per cent. following administration of Valentine's aqueous extract of liver by mouth. A similar case has been charted by FAIRLEY. Another patient showed no reticulocyte response to autolysed liver extract and a slight diminution in Hb content ; red cells increased slightly, but without clinical improvement. Lastly, two patients showed a mean Hb concentration of 20 and 22 per cent. Maximal doses of iron and ammonium citrate were given, with the idea that there might be Fe deficiency ; they did not, however, show any reticulocyte response, and both corpuscles and Hb slightly diminished. Intramuscular liver therapy led to a good response and the mean cell-haemoglobin concentration rose to 30 and 30·1 per cent. respectively during the period of observation.

H. H. S

FAIRLEY (N. Hamilton). **Prognosis of Tropical Sprue.**—*Lancet*. 1936. Apr. 18. pp. 911-912.

This is one of the excellent series of articles which have been published in the *Lancet* during the past year dealing with prognosis in different diseases. No better choice could have been made for writing on this vexed question than one who has himself suffered from the disease and has for some years made an intensive study of it from various aspects. The author starts by mentioning the views of investigators of sprue in Porto Rico that deficiency of the extrinsic factor in the diet is responsible and shows that to this there are several objections, *e.g.*, in India, Europeans with a diet containing ample sources of the extrinsic factor (red meat and eggs) acquire sprue, whereas Hindus and Moslems on a diet deficient in this factor, though they may develop macrocytic anaemia, do not suffer from sprue ; the same may be observed in Africa. [Sir Seymour SHARKEY used to say that the accuracy and depth of a man's knowledge of medicine might be gauged by his prognosis, for a true prognosis implies accurate diagnosis, knowledge of the normal course of a disease, its probable and possible complications, and also its treatment.]

In sprue there is a natural tendency to remission and relapse, and death when it occurs, if not the result of intercurrent disease, is usually due to either asthenia and persisting diarrhoea accompanied or not by tetany; to profound anaemia, or to ulceration and perforation. The most successful treatment on modern lines consists of rest, at first in bed; of graded diets of high protein, low fat and carbohydrate, and adequate vitamin; of liver extract *per os*, or parenterally, and calcium salts *per os*. Signs of progress to recovery are disappearance of abdominal distension and flatulence, cramps and tetany, diminution of stool in size and number and increase in body weight; restoration of blood to normal; decrease in faecal fat, increase of serum calcium, restoration to normal of the glucose-tolerance curve. Factors militating against recovery are age and complications (especially fever as indicative of intercurrent disease or intestinal ulceration, sprue being usually afebrile). Years may pass in perfect health when a relapse may suddenly occur, preceded in some cases by mental worry, diet indiscretion, chill. It is satisfactory, however, to know that in nearly all cases response to treatment is as satisfactory and often as prompt as in the first attack. The question of return to the tropics is always one of difficulty, but probably the criteria laid down by Dr. Fairley are the best guide at present, *viz.*, to allow those to go back who have shown no return of symptoms after 6 months on normal diet, whose haematological and biochemical findings are normal during the same period, who are suffering from no other disease and are not over 55 years of age.

H. H. S.

MILLER (D. K.) & RHOADS (C. P.). **The Effect of Liver Extract on the Small Intestine of Patients with Sprue.**—*Amer. Jl. Med. Sci.* 1936. Apr. Vol. 191. No. 4. pp. 453-456. With 4 figs. on 2 plates & 1 chart.

This is an interesting account of the action of liver extract in patients with sprue, comparing its effect with what is observed in pernicious anaemia. In some cases, after the blood condition has reached and is maintaining normal levels, if liver extract is not given at short intervals flatulence, cramps and diarrhoea are liable to return. Certain changes, mainly or entirely of a functional character, have been reported by the authors as occurring in the small intestine in sprue, such as abnormal motility, segmental variation in contour and calibre, etc. [see this *Bulletin*, 1936, Vol. 33, p. 64], and these might recur in spite of the general improved condition of the patient if the liver therapy was withheld for 1½-2 weeks.

A detailed clinical account of such a case, in a woman of 50 years, is given, who was followed up for some years during and after treatment for the active sprue, and the effect of the liver extract (Eli Lilly & Co.) on the functional activity of the small intestine was demonstrated. The authors have found that sprue or pellagra patients need much larger amounts of liver extract than do those suffering from pernicious anaemia; further, since more, much more, extract is needed to prevent diarrhoea than to maintain the blood levels, it is suggested either that "different fractions of liver are operative in sprue and pellagra from those which are effective in pernicious anaemia, or that the therapeutic action of the same substance varies in the three disease states."

H. H. S.

STRANDEL (Birger). **Experiments to isolate the Antianemic Principle of the Liver. Clinical Part.**—*Acta Med. Scandinavica*. 1935. Supplement 71. 52 pp. With 45 figs. & 3 charts.

In October 1934 the author reported to the Swedish Society for Internal Medicine the results obtained from the use of a new liver preparation, Pernami. These results were surprisingly good. One patient, however, did not respond even to large doses, but when the preparation was used in a concentrated form excellent results were obtained; this concentrated product was put on the market under the name Heptomin. During the past year further researches have been carried out, Per LALAND and Aage KLEM of Oslo undertaking the chemical part of the investigations and the author the clinical part. Numerous dried fractional products have been obtained and each of these has been tested clinically with a view to determining which of them was the active principle in the treatment of anaemia. Half a dozen or more extractives proved inactive, but a like number were tested singly and in combination and were found to give rise to a reticulocyte reaction 3–4 days after the first injection. Charts are given showing the effects of these. New fractions are being tried and auxiliary tests made to isolate the antianaemia principle of the liver. So far they have succeeded in extracting from 100 gm. of liver 0.0002 gm. of a dry substance of a potency that 0.002 gm. dissolved in water and administered intragluteally has proved highly active in combating pernicious anaemia. The research is not yet completed.

H. H. S.

REVIEWS AND NOTICES.

ROCKEFELLER FOUNDATION. INTERNATIONAL HEALTH DIVISION.
Annual Report 1935.—286 pp. With 35 figs. (3 maps) on 18 plates. New York: 49 West 49th Street.

The Annual Report of the International Health Division of the Rockefeller Foundation contains an account of its major activities in public health, epidemiology and research problems during 1935, but more than this it summarizes work previously accomplished which has led to the year's developments, and thus presents an altogether admirable review of the subjects dealt with, notably yellow fever, malaria, ankylostomiasis, tuberculosis and yaws, dealing with both the field and the laboratory aspects.

The aim is not to engage in extensive control of any of these diseases, but in the first place to study particular problems with a view to the wider application of knowledge so gained and to do this in countries and places which seem to offer the best opportunities for such study. In the second place to initiate schemes, to set up demonstrations for the local governments to take over as soon as they are going concerns and their utility has been confirmed. Thirdly, to provide aid to training centres and fellowships for public health workers. These are only a few of the benefactions conferred.

We may pass on to note in more detail a few of these activities, and pride of place must be given to *yellow fever*. Since 1931 an investigation has been carried on to determine the geographical distribution of yellow fever immunity in man. The African survey has now been completed, by testing sera for protection of mice, the sera being collected and sent in sealed ampoules under refrigeration to New York. Thus has been shown that immunity is widely, though irregularly, distributed from the coast of Senegal for some 3,300 miles to the upper reaches of the white Nile in the Anglo-Egyptian Sudan, with the Sahara as the northern boundary; on the south a line along the north of Angola running east to the southern part of the Belgian Congo. The western part of this, extending to Nigeria, has had several epidemics both on the coast and inland, and is still having them, in fact nearly all the historic outbreaks of yellow fever in Africa have occurred within this area. The eastern part has never been regarded as a yellow fever area, and many sera tested because of histories suggestive of the disease proved negative, and the heavily immunized areas seem to be continuously endemic rather than epidemic, unless the infection be with strains of virus different from the classic strain, and for this there is some laboratory evidence. In this area a zone of high prevalence of immunity among children and adults exists, and there is an exceptional opportunity for study by epidemiologists, pathologists, entomologists and zoologists for determining the symptomatology and pathology of the disease, the characteristics of the prevailing strain of virus, the oecconomics of the blood-sucking insect vectors, the possible animal hosts.

The survey of South America on similar lines, begun also in 1931, is coming to an end and has included all the Brazilian States and Paraguay, Bolivia, Chile, Peru, Ecuador, Colombia, Venezuela and the Guianas. No evidence has been found of the recent occurrence of missed outbreaks of the disease transmitted by *Aedes aegypti* in these places, but it has come to light that infection persists in certain districts

of the Magdalena Valley where *Aedes* is not found, although the river towns themselves with high *aegypti* index have not been affected in recent years. As the report states:—

" 1. Yellow fever has continued endemic in the, for many years, silent Amazon regions of Brazil, Bolivia, Peru and Columbia.

" 2. Yellow fever has not continued endemic in the Amazon Valley as the result of continued dissemination of its virus from the few larger centers of population, since the percentage of immunes in such large centers among the lower age groups is much less than that found outside of such centers.

" 3. Yellow fever has continued endemic in certain parts of the Amazon Valley in which the presence of *Aedes aegypti* has not been demonstrated after careful search."

The epidemiology of this *jungle yellow fever* differs altogether from that of the urban type, the latter being characteristically a "house" disease attacking non-immunes indiscriminately, whereas the former occurs in or close to uncut forest or jungle, and infection is contracted away from houses. Jungle yellow fever was first observed in 1932 in the Valle do Chanaan, Espirito Santo, Brazil, among workers in the fields, and a year or more later at San Ramón, Bolivia. Here too was observed the first indication that the endemicity of yellow fever might depend on the reciprocal interchange of jungle and urban virus. In 1933, an outbreak of 37 cases, 12 fatal, occurred in the Magdalena Valley, Colombia, at Caparrapi among workers sent to prepare land for crops. So the matter grew and a large area was revealed to be infected in southern Goyaz, western Minas Geraes, down to the State of São Paulo, an area of many thousands of square kilometres. It might be inferred that jungle yellow fever is usually an accidental infection in man, secondary to an epizootic or enzootic, analogous to human plague and rat epizootics.

Important results of recent laboratory work have been:—

" 1. The demonstration that the yellow fever virus can be transmitted from monkey to monkey in the laboratory by mosquitoes of the genus *Haemagogus*, a widely distributed genus, certain species of which have been observed viciously attacking man in districts of jungle endemicity.

" 2. The transmission of the newly isolated jungle virus from monkey to monkey in the laboratory by the *Aedes aegypti* mosquito, the most important urban vector of the disease.

" 3. The demonstration of naturally acquired immunity in monkeys of three different species caught especially for this study at three widely separated points in South America."

Malaria naturally occupies an important place in the Foundation's activities. Work has been carried on in Cuba, Porto Rico, Nicaragua, Salvador, Colombia, Greece, Albania, Italy, Bulgaria, Cyprus, Portugal, Spain, India and elsewhere; surveys and control demonstrations, biological factors in control, the use of Paris green (an important feature of which is the new dustless method of spread by using a mixture of Paris green and kerosene, the latter not being utilized as a larvicide *per se* but merely as a vehicle for spreading and keeping afloat the Paris green), studies of anophelines, of malaria parasites and of their therapeutic use have all been taken up.

Hookworm campaigns continue to confer untold benefits in many parts of the world, but the story has been related so often that it needs no repetition now. We cannot do more than mention other subjects of investigation and research, *anaemia*, *sprue*, *amoebiasis*, *schistosomiasis*, *yaws* and its transmission, especially the possibility of

Hippelates pallipes as the vector, and finally *tuberculosis* in different countries. The report ends with a sketch of its general sanitation work and a table of the expenditure during the year. A wonderful record of work and world-wide benefaction.

H. H. S.

NORMAN (Vincent) [M.D., M.R.C.P., London, F.R.C.S. Edin., D.P.H. Lond.]. **Essentials of Modern Medical Treatment.** With Foreword by S. Watson SMITH.—pp. xvi+200. 1936. London: Hutchinson's Scientific and Technical Publications, Paternoster House, E.C.4. [10s. 6d.]

In this book the author has undoubtedly summarized a great amount of information which will be a help to the busy practitioner, some of it such as cannot be readily found in the text books. Newer means and methods of treatment are included. Alternative remedies are suggested for many complaints, while the inclusion of what might be termed minor affections, such as "the common faint"—to use the author's own term—will make the book serviceable to the student. A useful index is appended.

A feature of the book is the number of proprietary drugs and preparations, with the names of the makers, mentioned. This is not uncommon in articles on tropical medicine but its appearance in a book on general medicine is an indication of the modern trend to prescribe these articles. In stating where certain of the less frequently required serums, antitoxins, etc., may be obtained the book will be useful for rapid reference.

The "conciseness" of the book is emphasized as a valuable feature. The text is telegraphic in style, and this in certain places not only leaves the reader in doubt but may involve serious risk from overdosage. Instances in point occur in the treatment outlined for taeniasis and ascariasis. Where large doses of vermifuges are to be given the amounts advised and the method of treatment in detail should be free from ambiguity.

It is perhaps owing to the effort at brevity that the author is not successful in his dealing with tropical complaints. Among the notable omissions are ankylostomiasis, the undulant fevers, infectious jaundice and leprosy. Bacillary dysentery is not regarded as a separate disease. Other tropical conditions such as Leishmanial sores, Calabar swellings, climatic bubo and certain skin diseases probably do not occur so often in the practice of the general practitioner as to warrant their inclusion.

Certain statements in the book call for comment. That "M.T. malaria is notoriously difficult to cure" is not borne out in practice. Benign tertian malaria is found to be much more persistent. "Atebrin is non toxic" can hardly be supported in view of the reports of cerebral excitement, mental and other symptoms which have followed its use in Malaya and Ceylon. Blackwater fever can occur in patients who are taking fair doses of quinine regularly, and even a small dose of quinine, given to a patient in the preblackwater stage has been seen to precipitate haemoglobinuria. No mention is made of the need to keep the urine alkaline, of the value of sterile glucose solution intravenously, and of the wonderful success of blood transfusion in the treatment of blackwater fever.

In SCOTT's treatment for sprue parathyroid extract is given with the calcium lactate, and foudadin should be included in the remedies for bilharziasis. Yatren does not "disappoint" in the treatment of

amoebic dysentery when combined with emetine bismuth iodide, as pointed out by MANSON-BAHR. "Carbazone," another substance useful in amoebiasis, should be carbarsone. The improved open operation, with Carrel-Dakin irrigation and drainage as advocated by KILNER, is still often necessary in amoebic abscess of the liver where repeated aspiration has failed, and is giving much better results.

In trypanosomiasis the danger of blindness following the exhibition of tryparsamide should be stated. Regarding epilepsy no reference is made to the need of differential diagnosis from cysticercosis in man as shown by MACARTHUR. Malarial therapy in general paralysis of the insane has proved its value but to give the patient 5 cc. of malarial blood intravenously as advised, instead of intramuscularly, involves the grave risk of incompatibility.

The book is described as "a work of ready reference for both the man in active practice and for the student requiring rapid revision for his final examination. It will also be valuable to those working for the higher examinations in medicine." While undoubtedly the volume will be of use both to the practitioner and student the parts dealing with tropical diseases will need considerable revision before this claim—particularly in its latter half—can be substantiated. *W. E. Cooke.*

TROPICAL DISEASES BULLETIN.

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[No. 2.

THE HEALTH UNIT SYSTEM IN TROPICAL RURAL AREAS.

By J. Balfour KIRK, M.B., Ch.B., M.R.C.P., D.P.H., D.T.M. & H.

Director, the Medical & Health Department, Mauritius.

The type of Sanitary Administration first formulated by me under the designation the Health Unit System was the outcome of a study of local conditions in Mauritius when the subject of the reorganization of the Medical & Health Department was being examined by a Commission appointed by the local Government in December 1927. It was my privilege to assume full control of the Department at the same time and to be faced with a rapidly falling budget due to the gradual development of the economic crisis which eventually made its presence felt all over the world. I thought that the best way to facilitate the work of the Commission would be to give it something concrete to discuss and the memorandum on Health Services in the Rural Districts was one of the documents submitted to them. It was in this memorandum that the Health Centre System was first defined and described.

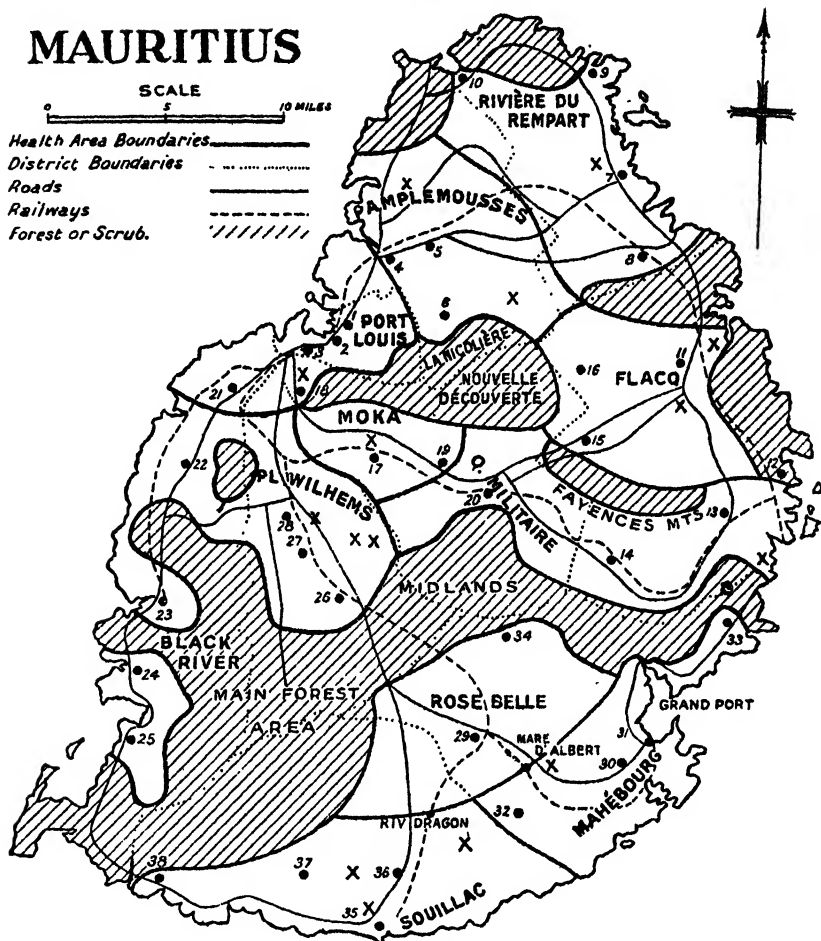
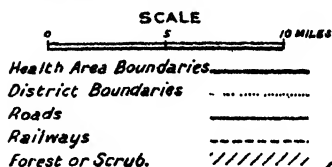
To understand the considerations which led to the evolution of what might be termed the health centre idea, a brief description of the Colony is necessary.

Mauritius is a sub-tropical island in the South Indian Ocean, 720 square miles in area, lying about 1,500 miles to the east of the Natal coast. A glance at the accompanying map will familiarize the reader with its main features. Round the coast the land is low lying but it rises gradually towards the centre of the Island to about 600 feet. Thereafter the rise is steeper, so that the central districts of Plaines Wilhems and Moka, and part of Flacq, lie between 1,200 and 1,800 feet above sea level. The climate is not oppressive and there are distinct warm and cold seasons. The rainfall is abundant in the central part of the Colony. On the coastal belt the west and north are very much drier than the east and south.

The modern history of Mauritius begins in 1735 with the landing of Bertrand François Mahé de la Bourdonnais, who may be regarded as its founder. Since his time the Island has been in uninterrupted European occupation, first by the French, and, from 1810 onwards, by the British.

When the Island was first discovered by Europeans it was uninhabited. The Dutch occupied it from 1638 until 1710, in which year they withdrew, leaving behind them a certain number of escaped African slaves. The French occupation was effected by a settlement of a number of European colonists from the neighbouring Island of

MAURITIUS



HOSPITALS AND DISPENSARIES are shown in the Map by Numbers as indicated below.

Port Louis.

Civil Hospital	... 1
Eastern Suburb	... 2
Western Suburb (Bell Village)	... 3

Pamplemousses.

Terre Rouge	... 4
Pamplemousses	... 5
Long Mountain	... 6

Rivière du Rempart.

Poudre d'Or	... 7
Ravin	... 8
Grand Gaube	... 9
Grand Bay	... 10

Flacq.

Flacq Hospital	... 11
Trou d'Eau Douce	... 12
Rivière Sèche	... 13
Sébastopol	... 14
St. Julien	... 15
Brisée Verdrière	... 16

Moka.

Moka Hospital	... 17
Pailles	... 18
St. Pierre	... 19
Quartier Militaire	... 20

Black River.

Petite Rivière	... 21
Bambous	... 22
Tamarin	... 23
Grande Rivière	... 24
Noire	... 24
Case Noyale	... 25

Plaines Wilhems.

Curepipe	... 26
Vacoas	... 27
Victoria Hospital (Quatre Bornes)	... 28

Grand Port.

Rose Belle	... 29
Plaine Magnien	... 30
Mahébourg Hospital	... 31
L'Escalier	... 32
Bois des Amourettes	... 33
St. Hubert	... 34

Savanne.

Souillac Hospital	... 35
Rivière des Anguilles	... 36
Chemin Grenier	... 37
Baie du Cap	... 38

OTHER VILLAGES "proclaimed" for sanitary regulation are shown by a X.

Map showing Health Areas.

Réunion, at that time a French possession, who brought their slaves with them and, as their enterprises developed, added to their numbers by purchase from abroad, principally Madagascar and East Africa. The conquest of the Island by and its ultimate cession to the British made little difference to the European resident population, who though they subscribed to the British oath of allegiance remained essentially French in their language, customs and outlook.

Economically Mauritius was a slave-owning Colony subsisting on agriculture. In 1835 slavery was abolished and the determination of the liberated negroes not to work on the land created an economic crisis which was only relieved by the importation from India of labourers for work on the estates under a system of indenture. It was not, however, until about 1843-44 that the labour problem was satisfactorily solved by the institution of regular arrangements whereby some 6,000 persons were admitted annually from India to undertake on indenture the agricultural labour so distasteful to the negro.

Those events have given the population its present mixed character. There were 392,938 persons enumerated in the Colony during the census of 1931. Of these 268,349 were of Indian race, 8,923 were Chinese, and the remainder, 115,666, comprised all persons in the Colony not acknowledging Indian or Chinese race. Among this number were some 10,000 indigenous whites, the remainder being either of pure African race or of mixed blood.

The composition of the population and a knowledge of their various occupations give a pretty good indication of what may be expected in the way of sanitation. The standards vary from the very high personal standards of some of the European inhabitants to the kind of thing experienced sanitarians have come to regard almost with despair as the sanitary standards of rural Asia. Since, however, the public hygiene, by which is meant the cleansing of the public thoroughfares and the general upkeep of public services, has always been in European control the superficial impression made by the Colony is one of cleanliness. It is only when one studies the habits of the people, the diseases from which they suffer, and the domestic environment in which the majority pass their lives that one realizes how far the personal hygiene of most of the inhabitants falls behind the standard set by the public authorities and the imposing volume of sanitary legislation enacted by the Legislature.

The main industry of the Colony is the production of sugar and the principal occupation of the population agriculture. Most of the Indian population are agriculturists. The Africans and those of mixed race find employment as artisans, skilled non-agricultural labour, and fishermen. The professions are open to all races and contain worthy representatives of various elements of the population.

For many years the labouring population lived on the sugar estates in quarters provided by their employers. Employers of resident labour were, and still are, required to provide free medical attendance and hospital accommodation as prescribed by statute. In spite of these advantages there has been a gradual drift of labour from estates to villages or small holdings, although these have mostly been established in the agricultural areas. The population of the rural districts is predominantly Indian, except for small fishing villages situated at certain parts of the coast. The African population apart from those inhabiting the fishing stations, tend to be town dwellers since their work

is largely in connexion with housing and occupations in which machinery figures.

An agricultural community is always liable to fluctuations in prosperity. The bigger the community and the more diverse its agriculture the more do those fluctuations tend to be smoothed out, because conditions affecting one crop may not always affect the others in the same way. When the community is a small one and its livelihood depends upon one single agricultural product it is exposed to the full impact of economic fluctuation, and this has always been the condition of Mauritius. Throughout its history it has experienced great fluctuations in prosperity but perhaps none so great as that seen after the conclusion of the war of 1914-18. Between 1917 and 1923 the Colony was more prosperous than it had ever been. From 1923 onwards the economic position gradually deteriorated until it reached a point where in the absence of assistance from the Imperial Government the sugar industry of Mauritius, in common with that of other colonial possessions, could not have survived. As it is, the industry has long since used up the reserves it accumulated in the years of plenty and it is now only able to survive through the preferential tariff accorded it by the British Government. The economic situation did not become really acutely bad until 1929-30, but the signs of an approaching depression were plainly evident before then.

When I assumed the administration of the Medical and Health Department in December 1927 the Department had attained proportions out of all relation to the future budgetary prospects of the Colony as a whole. Moreover, it was not efficient. The years 1921-25 were years of great prosperity for the administration as well as for the Colony. More services were demanded of the administration than it could be expected to fulfil. During the war great difficulty had been experienced in the recruitment of staff and a severe epidemic of influenza in 1919 had dealt it a severe blow. Bubonic plague reappeared in Port Louis, the capital, in 1921 and spread inland. Emergency measures had to be taken by the Medical and Health Department and a staff had somehow to be recruited. There was little wonder that much of the Department was unbalanced, expensive and unsatisfactory. The Department in fact, encouraged by the Legislature, had bitten off much more than it could chew. The only motive power that could keep it running was lavish expenditure.

In 1927 the Departmental organization conformed in the main to the principles then generally operative of having a Medical and a Sanitary Branch. There was also a central laboratory which served both branches. The administrative unit of the Colony was the district, of which there were nine. The district of Port Louis comprised the town of Port Louis and the neighbourhood. It was about 16½ square miles in area and contained nearly 55,000 inhabitants. The district of Plaines Wilhems was the central district of the Colony, lying mostly at a height ranging between 1,000 and 1,800 feet above sea level, and having a population of over 95,000 inhabitants, who were mainly resident in a string of villages and townships extending from Curepipe in the south (altitude about 1,500 feet) downwards along the main Port Louis-Mahebourg Road to Beau Bassin (altitude 600-1,000 feet) in the north. Port Louis was essentially a town which could be administered with the usual urban type of sanitary department and, though Plaines Wilhems occupied 78½ square miles, most of its problems were those of a semi-urban area. Moreover it was the residential district of

the European and the more prosperous members of the other elements of the population, whose sanitary practice was appreciably different from that of the majority of the 243,000 inhabitants of the other seven districts, known locally as the rural districts.

There were three hospitals in the Colony equipped as general hospitals—the Civil Hospital, Port Louis, containing some 300 beds, the Victoria Hospital, Quatre Bornes, in the district of Plaines Wilhems, having 270 beds, and a small but well equipped hospital at Moka, having a capacity of 80 beds.

The Departmental organization in the rural districts was as follows :—

In each rural district with the exceptions of Black River, which fed the Victoria and Civil Hospitals, and Moka, the hospital of which was equipped as a surgical unit, there was a small district hospital maintained by the Government. The number of beds in the district hospitals varied between 80 and 100, more or less according to the size of the district population. Associated with the district hospital was a number of dispensaries each with a trained hospital orderly (Dispenser) in residence. A whole-time Government Medical Officer was employed. He resided in the district and his duties were (a) the administration of the district hospital; (b) twice-weekly consultations at the Dispensaries; (c) Police Surgeon for the district; (d) Public Vaccinator for the district; (e) Medical attendant to a certain number of resident Government officials. In addition to these duties the Government Medical Officer was also the officer responsible for the district administration of poor relief. The Dispensers in charge of the Dispensaries assisted the Government Medical Officer in the poor relief work by keeping the records of paupers and generally acting as poor law clerks. In some areas they also fulfilled the duties of postmaster and Civil Status Officer (Registrar of Vital Statistics) as well.

Each district had, in addition, a resident staff of sanitary subordinate officers controlled by two Medical Officers known as Sanitary Wardens. One had charge of the northern districts of Pamplemousses, Rivière du Rempart and Flacq; the other of the districts of Moka, Grand Port and Savanne. The sanitation of the district of Black River was controlled by the Medical Officer in charge of the police and prisons in Port Louis, who also visited the five dispensaries in the district twice a week.

I had studied this organization carefully during the year in which I held the acting appointment of Director of the Department and had formed the opinion that it contained a number of undesirable features. So far as the medical staff were concerned, much of their time was absorbed with poor relief work which could have been done equally satisfactorily by laymen. In the majority of cases the applicants for relief were persons quite incapable of earning their living because of their bodily infirmity, and it did not need a medical officer to conduct the exhaustive enquiry directed to ascertain whether or not they had relatives able to support them.

On the sanitary side the Sanitary Wardens could give only part of their time to their districts. They were not resident in them and much of their time was spent in proceeding daily between their spheres of operations and their homes. The sanitary subordinate staff were left a good deal too much to themselves. This is seldom healthy in a place where the attitude of the inhabitants when brought into direct contact with the representatives of authority, be it sanitary or other, is one of nervous propitiation.

In their relations with the public the sanitary staff were as unwelcome as the medical staff were appreciated. Yet these officers merely represented different aspects of the Department's activities for the general well-being of the community.

A consideration of the diseases of public health importance in the rural districts reduced them to four: malaria, ankylostomiasis, venereal disease and tuberculosis. A good deal of the recorded anaemia was probably secondary to malaria or ankylostomiasis, while much of the nephritis, which was fairly prevalent, could be ascribed probably to malaria. These four diseases have this in common, that simple hygienic measures can be relied upon for their prevention, that their epidemiological features are well known, and that dispensary work forms a very effective method of dealing with them, because though their ultimate control rests finally with the individual, much useful preliminary work can be carried out by the State, and the dispensary is one of the best means by which this may be done. In view of all these considerations it appeared to me, therefore, that in order to devise a cheap and effective instrument for the control of these infections it was necessary to consider the problem afresh.

Other factors had to be considered. The most important was the means whereby some of the appreciation manifested on account of the Department's therapeutic activity could be placed to the credit of its sanitary endeavour. Another was how to stimulate some kind of interest in the rural dweller in the preservation not only of his own health but also in that of his children. In a communication to the Government on this subject I wrote as follows:—

"I have already remarked in the Council of Government that there is a very definite limit to the amount of control which can be exercised by a Health Authority over a communicable disease. Beyond this limit the health campaign must be carried by individual effort. To get the fullest benefit from whatever action the local authority may take, the private citizen must himself contribute to the campaign. His contribution is the intelligent exercise of personal hygiene.

"The exercise of personal hygiene implies that the citizen has some knowledge of matters affecting his health. It also implies that he appreciates the importance of taking active steps to preserve his health, so far as these lie within his power. Unfortunately, at the present time the rural dweller knows little and appears to care less about those things. But unless he is brought to realise their importance and is given the instruction which will enable him to co-operate with the health authority little progress can be made, whatever the health authority may attempt. Who is the best person to impart this instruction to him? It must be someone in whom he has trust and preferably to whom he is bound by some tie of gratitude.

"It appears to me that the person most likely to have these qualities is the doctor who attends him when he is ill. Another consideration which leads me to the same conclusion is this: the healthy human being has an instinctive disinclination to think about his health; the convalescent patient, on the other hand, evinces what is sometimes a morbid interest in the subject. It seems to me, therefore, that the physician is the person best qualified to impart the necessary instruction, for he not only has the confidence of the convalescent patient and his friends but he has also the opportunity to instruct the patient in the art of keeping well at the time when the patient is in his most receptive mood.

"These considerations lead me to the conclusion that the health work of the rural districts should be carried out under the direction of Medical Officers, whom we may term Health Officers, undertaking medical and sanitary duties in that form of activity known as the practice of preventive

medicine. To assist the health officer in his work he will be given medical and sanitary subordinates assembled in a unit known as a Health Unit. The headquarters of each Health Unit would be located in a building or group of buildings known as a Health Centre."

The district health unit would therefore consist of the District Hospital and a number of satellite health centres each with its appropriate staff. In Mauritius I formed the opinion that one Health Officer could exercise adequate supervision and control of five health centres as a maximum as well as the administration of the District Hospital and the treatment of the patients therein. The District Hospitals are not intended nor are they equipped for major operative surgical work. This is done in the Civil, Victoria and Moka Hospitals, to which District Hospitals refer their serious cases. No health centre would be more than ten miles from the District Hospital, in the neighbourhood of which the Health Officer would reside, and as there were excellent roads linking up the different units of the proposed system the programme laid down was well within the capacity of a fit and energetic officer supported by a well trained subordinate staff. But it was essential for the proper operation of the system that the officers should be relieved of the poor law work, so as to have their whole time available for their professional duties. When the system was in full operation the subordinate personnel of each health unit would be a Sanitary Inspector, a Health Visitor, a Midwife and a Dispenser. The duties laid down for these officers were as follows :—

The Sanitary Inspector would concern himself with such matters as the prevention of mosquito breeding, domestic hygiene, the supervision of the sanitary services in the areas of the health centres and the administration of the sanitary law which included practically every form of sanitary activity in his area.

The Health Visitor's duties would be to supervise the work of the Midwife, visit the mothers of newly-born babies and keep in touch with the children, act as school nurse, see that the instructions of the Health Officer regarding the care and treatment of the school children were being observed, attend at the ante-natal clinic and generally carry out such other duties as the Health Officer may require.

The Dispenser's work would be to dispense and distribute medicine and undertake simple treatment under the direction of the Health Officer and to co-operate with the Health Visitor and the Sanitary Inspector in the work of the unit.

The duties of the Midwife need no special reference.

All subordinate officers of the unit will be expected to keep the records of their respective branches under the general supervision of the Health Officer.

From the above the work of the unit may be deduced. It may be summarized graphically as follows :—

Health Unit
Health Officer

Dispenser, Health Visitor, Midwife
Medical relief
Inspection and treatment of School children
Conduct of Ante-natal Clinic
Supervision of Midwives
Vaccination of Infants
Special campaigns in the area

Sanitary Inspector
Sanitary Inspection
Supervision of sanitary services.
Administration of Sanitary Law
Disinfection
Inspection of markets, abattoirs, cow-sheds, etc.
Maintenance of anti-mosquito works in the health centre area.

The following accommodation was recommended for each Health Centre :—

Pharmacy—

Two small rooms containing two beds each for the reception of patients awaiting transport to the District Hospital.

Health Officer's room for the examination of patients.

A general purposes room for the ante-natal clinic, dressing of wounds and minor surgical work.

Two store rooms : One for the Dispensary and one for Sanitary Stores.

One office room to be shared by the Sanitary Inspector, Health Visitor and Midwife.

A four-roomed house for the Dispenser.

The memorandum embodying the gist of these recommendations was submitted to the Commission, among whose members it caused a good deal of discussion. Circumstances necessitated at a later date the elaboration of the proposals to the Government, and while I was engaged on this it struck me that this type of organization might be found suitable in rural areas of other tropical countries. I accordingly included a short account of it in my book published in 1931 (Kirk, 1931).

The Health Unit System appears to me to have many solid advantages. It can be instituted in a very small way and gradually and unobtrusively built up as trained personnel and funds become available. In most British territories in the tropics the nucleus is already there in the system of rural dispensaries or sub-dispensaries which has been established as an integral feature of the administration. These can be expanded into Health Centres without greatly modifying their character, in fact the expansion will come as a phenomenon of the normal evolution of such institutions. The population therefore are not faced with the appearance of something unfamiliar to them. It can be extended almost indefinitely without losing its fundamental character and new areas incorporated within its jurisdiction without fuss. Since the groups of centres function directly under one Health Officer, correspondence is reduced to a minimum ; information is received directly by the man who has to act upon it and in this way the interval between the occurrence of an event and the execution of the appropriate action is reduced as far as it is humanly possible to do so. The only disadvantage I can see is that the fundamental principle underlying its adoption is the prosecution of intensive preventive medicine in restricted areas. For Mauritius I recommended that the Health Unit should work in an area of about two or three miles radius, because no rural collection of dwellings exceeds this, which might be too small elsewhere. But I think the disadvantage implied in this limitation is more apparent than real. It is becoming increasingly evident that man's chief danger is man himself and that the closer he herds the greater is this potential danger. We may therefore safely leave the intervening sparsely populated areas to look after themselves for the time being and concentrate upon the closely inhabited places.

The system may operate satisfactorily in big territories by means of a travelling health unit. In such an area, however, a larger professional staff would be necessary because the District Hospital, which is always the nucleus of the system, however widely separated are the tributary health centres from it, could not be left unattended while the Health Officer was on tour with the unit. In the course of time centres could be gradually built up in populous parts and linked with the District Hospital in the way already described. The work of

the unit would then become static instead of peripatetic, but it should retain its dynamic character.

Others were being gradually faced with the same problem which I had attempted to solve as described. In September 1930 the Spanish Government proposed to the Council of the League of Nations that the League should convene at Geneva a conference of representatives of European States for the purpose of a technical international study of rural hygiene. This proposal was adopted and the Committee appointed by the League for this purpose issued its report from Geneva on July 31st 1931, (League of Nations. 1931). The first volume of the report contains the Committee's recommendations, and when I read it I was struck by the remarkably close resemblance between the arguments adduced by the Committee and those submitted by me to the Mauritius Government. The similarity of the conclusions reached was also noteworthy. There were naturally differences in detail owing to the differences in the status of the inhabitants in the areas under consideration and of the forms of Government, but the principles laid down were in complete accord.

In their description of the Rural Health Centres the Committee wrote "The Rural Health Centre may be defined as an institution for the promotion of the health and welfare of the people in a given area, which seeks to achieve its purpose by grouping under one roof or co-ordinating in some other manner, under the direction of the Health Officer, all the health work of that area. . . ." There is no essential difference between this and what I have already mentioned above—"These considerations lead me to the conclusion, etc." The Committee emphasized that the rural health centres constitute an integral part of the general health organization, as I myself had done. For the subordinate staff of the Health Centre the Committee recommended a Health Visitor, Sanitary Inspector and Midwife. Under the European scheme the Health Visitor would combine the duties I had allocated between the Health Visitor and Dispenser. It should be remembered that the European population could get their medicines in pharmacies, which do not exist in tropical rural areas.

In November 1932 an International Conference of Representatives of Health Services of certain African Territories and British India was held at Cape Town (1933). Among the numerous subjects studied by the Conference was Rural Hygiene. The Conference stressed the inadvisability of separating preventive from curative medicine in so far as the personnel which comes in direct contact with the common people is concerned. This was an important consideration, which led me to advocate the Health Centre System, but I have the feeling that the Conference went rather too far when they suggested that "The dispenser should be given a little more instruction in public health and the Sanitary Inspector a little more instruction in treatment." I do not consider this to be a good policy. It must be remembered that the subordinate staff of a health unit are being taught something entirely unfamiliar and it is therefore advisable that the training should be clearly focussed on what they will be expected to do every day. By all means give the Dispensers a preventive outlook during their training in diagnosis and therapeutics and let the Sanitary Inspector know whether or not the diseases with which he will have to deal are capable of responding satisfactorily to treatment, but I think it better to keep their functions separate though encouraging them in the closest co-operation.

In response to a number of private enquiries I contributed an article in 1934 in which I briefly described my conception of the system in its fully developed form (Kirk, 1934). The main administrative unit was the Provincial Unit, which consisted of the Provincial Hospital which would bear the same relation to a number of District Hospitals as the District Hospital bore to its Health Centres. The Provincial Hospital would be a large hospital equipped for modern medical and surgical practice. It would also act as the training depot of the subordinate staff. There would also be the Provincial Laboratory, Sanitary Engineering Department and Epidemiological Bureau. The Provincial Unit would have its own staff of administrators and specialists and would deal with the Headquarters of the Government Health Department.

It is difficult to indicate the optimum areas to be served by the Health Centres, District Units and Provincial Units, because so much depends upon the density of population, means of transport and the type of country which is to be worked. In Mauritius the administrative District was a convenient District Unit, averaging a population of about 30,000 persons, and an area of between 60 and 100 square miles, a good deal of which is under timber and is not inhabited at all. The Colony itself with a population of nearly 400,000 and an area of 720 square miles constituted what would be the provincial Unit in a larger territory.

For backward rural areas the Health Centre System is certainly more economical in professional staff than in the type of administration based on a separation of therapeutic and sanitary activities, and for many years to come it looks like being the optimum type of administration for such areas. It is possible that as prosperity comes to these regions, the population increases, and a higher standard of living becomes established, the Health Centre type of administration may become inadequate and another form of administration devised based once more on the separation of curative from preventive medicine. But such a contingency is unlikely to arise for a great number of years unless there is a radical change in the educability and the hygienic practice of the tropical rural equivalent of the man in the street.

The appearance of the League of Nations report to which reference has already been made, was followed by a reference to the Health Centre System in the Annual Report of the Medical Department of Kenya Colony for the year 1933. This report detailed the chief objects of the Field Medical Services in the Native Reserves and went on to state that "with a view to the achievement of these objects, which clearly require for their fulfilment the closest of contact between the Medical Service and the community, the district medical organisation of Kenya has for many years past been developed according to a system which has recently been given prominence in an important publication of the Health Organisation of the League of Nations—the system of a Central or 'Secondary' Health Centre in each district governing and working through a series of subsidiary or 'Primary' Health Centres." (PATERSON, 1935). It would appear, however, that the Health Centre idea had never been clearly formulated and made known to other neighbouring Colonies, for we find that when Uganda was faced with the same problem it approached it in much the same way as I had done in 1927. In the Annual Report of the Medical and Sanitary Department for the year 1933 we read the following:—"The

problem therefore arose as to how best to provide for improved health services with the limited staff and money available. The first step was the diversion of the activities of the Medical Officer from purely curative work to include the development of rural sanitation in his district, particularly in the areas immediately surrounding the sub-dispensaries, which lent themselves to a ready conversion into health centres inasmuch as the curative medical work carried out in them during the past few years had secured the confidence of the neighbouring population." (KAUNTZE, 1934).

In Mauritius the difficulty of devising suitable alternative means of relieving the Medical Staff of poor relief work has hitherto prevented the establishment of the Health Unit System. But this year a trial is being given in the district of Plaines Wilhems to a new system for the administration of poor relief in the Colony, and if the trial proves successful the system will be applied next year throughout the Island. The relief thus afforded to the Medical Staff will enable the establishment of the Health Unit System in a more complete form than has hitherto been possible. The first step has already been taken for some years by the abolition of the posts of Sanitary Wardens and the assumption of preventive duties by the District Medical Officers who have taken over the control of the Sanitary Staff. Further than this it has not yet been possible to go.

For the first detailed account of a Health Unit in action credit must be given to Uganda. HOOPER and LOEWENTHAL (1936) have recently published an interesting account of the working of such a Unit in the Teso district of Uganda. This district extends over an area of some 4,000 square miles and contains a population of 295,000, mostly Africans together with a handful of Europeans and Asiatics. For this population there has been provided the following staff, admittedly inadequate, but undoubtedly making their presence felt :—

1 European Medical Officer, 1 European Nursing Sister, 1 European Sanitary Inspector, 1 Indian Sub-Assistant Surgeon, 1 Senior African Medical Assistant, trained male and female attendants at the district hospital, 2 African Midwives, 1 trained Laboratory Assistant, 2 Mosquito Searchers, 6 Sanitary Orderlies.

The administrative headquarters are situated in Soroti, which is the principal town of the district. The district hospital is situated there. There are apparently four sub-dispensaries in the rural areas, which are now being developed as Health Centres. The reader should consult the original paper for details, and not the least interesting feature of it is the evidence of the enthusiasm of the staff for the new arrangements.

JACOBS (1933) has written an interesting description of the system adopted in Ceylon. The Ceylon Health Unit, however, differs fundamentally from the system with which this account is concerned in that it is the familiar urban type of health administration modified to suit rural conditions. He states "The object [of the health unit scheme] is to bring to rural areas the benefits of health protection which are now enjoyed by large towns and cities. This end is accomplished by dividing rural areas into suitable districts and introducing therein small but completely trained bodies of workers who remain permanently in the delimited area and undertake all public health problems. Their activities embrace health education, general sanitation, collection, tabulation and study of vital morbidity statistics, control of preventable endemic and epidemic diseases, vaccination and preventive inoculation,

maternity and infant welfare work, school health work, and adult hygiene." Jacocks states that more than 600 of these organizations are now functioning in various countries in Europe, Asia and America.

It will be seen from the preceding paragraph that general medical care of the population is outside the sphere of the health unit which doubtless works in close collaboration with, but quite distinct from, the purely medical organization. It is in this respect that the Ceylon Health Unit differs from the type evolved in Mauritius and in tropical Africa. The Ceylon Health Unit designed for a population of about 80,000 has the following staff: 1 medical officer of health, 1 clerk, 5 sanitary inspectors, 6 midwives and a number of minor employees, part of the expenditure being borne by the Central Government and part by the local authorities comprised in the area of operations. In the densely populated parts of the world in which this unit has been evolved such an organization is undoubtedly effective. But in the vast sparsely populated areas of tropical Africa it is doubtful if this type of organization could effectively deal with such numbers. The distances to be traversed would alone present an almost insuperable obstacle to effective activity to what appears to be a highly centralized and therefore somewhat rigid type of administration. The Mauritian system of health units has the merit of being able to be expanded almost indefinitely without losing its fundamental character or its effectiveness. Perhaps in actual operation the difference would be more apparent than real but from the theoretical viewpoint the Mauritian system appears more suited to sparsely populated countries than the Ceylon system.

It is hoped that this account of the evolution of a system of rural sanitation will be useful to other administrations faced with the same problems as those described. The writers of administrative reports are apt to take much of their organization for granted and to assume that other administrations are working on more or less the same lines. A striking example of this has already been quoted regarding Kenya and Uganda, two neighbouring colonies in close administrative touch with one another. One had already solved its problem; the other, apparently in ignorance of this, was obliged to reason out its own solution from first principles.

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TRYPANOSOMIASIS.

BRITISH EAST AFRICAN TERRITORIES, CONFERENCE OF GOVERNORS OF: **Research Conferences. Conference on Co-Ordination of Tsetse and Trypanosomiasis (Animal and Human) Research in East Africa held at Entebbe, 29th to 31st January, 1936.**—87 pp. Nairobi: Govt. Printer.

After some introductory remarks by the Governor of Uganda, the Conference proceeded to consider the progress made in the Programme of Research drawn up at the 1933 Conference [this *Bulletin*, 1935, Vol. 32, p. 12.] A number of progress reports were before the Conference; these are printed in a series of Appendices at the end of the Report.

The conclusions reached from the discussion of the 1933 Programme are briefly as follows:—

ii.—*Question of natural immunity, spontaneous cure and acquired immunity in man.*—It was decided that although every opportunity should be taken to pursue investigation of these points, the item should not be included in the programme of research.

iii.—*Experiments on relatively resistant ruminants with strains of T. rhodesiense and T. gambiense obtained over as wide an area as possible.*—After discussion, in which Hornby, Mettam, Bennett, Potts and Kennedy took part, the Conference agreed:—

- " (1) that the strains of *T. brucei* and *T. rhodesiense* used at the Entebbe Veterinary Laboratory should be sent to the Veterinary Laboratory, Mpwapwa, and to Dr. Bennett in the Sudan for testing on the cattle in those areas;
- " (2) that further experiments should be carried out at the Entebbe Veterinary Laboratory to determine whether or not Zebu cattle were more resistant to infection with *T. brucei* than cattle of the Ankole type;
- " (3) that the possibility of transmission of *T. brucei* and *T. rhodesiense* to cattle by *G. palpalis* should be studied at Entebbe.

iv.—*Existence of other reservoirs than man of T. gambiense and T. rhodesiense.* Corson stated that he had passed *T. rhodesiense* through various animals, and had shown that over a long period no change of virulence had taken place. Fairbairn considered that there was a possibility of the existence of another reservoir than man for *T. rhodesiense*. The Conference agreed:—

- " (1) that the work at the Tinde Laboratory on the existence of other reservoirs than man of *T. rhodesiense* should be continued;
- " (2) that it is important to examine the possibility of the existence of other reservoirs than man for *T. gambiense*, although with the present facilities for laboratory work in East Africa this investigation cannot be undertaken at the moment."

v.—*Retention of acquired characteristics of trypanosomes during cyclic evolution in the body of the tsetse fly.*—After considerable discussion it was agreed:—

- " (1) that the influence on the virulence of *T. gambiense* of repeated passages through *Glossina morsitans* and monkeys, which has been carried on at Tinde Laboratory, should be continued;
- " (2) that it was of great importance that investigation of the question of arsenic resistance in different strains of *T. rhodesiense* and *T. gambiense* should be further investigated. The Conference understood that if it could be arranged this would be carried out in the Tanganyika Territory."

vi.—*Evolution of different trypanosomes in body of tsetse and other biting flies and relationship to environment (climate, etc.) of cyclic transmissibility and pathogenicity.*—A paper by Lamborn on this subject (Appendix xii) was considered and the matter was discussed by Mettam, Hargreaves, Hornby and Hart. The Conference agreed that in view of the absence of evidence of cyclic transmissibility in biting flies other than tsetse this investigation should be deleted from the programme of research.

It was decided to consider together the following items of the 1933 programme :—

vii.—*Biological studies of tsetse flies in T. rhodesiense, T. gambiense and T. brucei areas.*

viii.—*Study of food supply of tsetse as determined by the biological study of stomach contents of fly.*

xiii.—*Control of tsetse fly.*

xviii.—*G. palpalis.*—*Bionomics, food of, trapping, and size of barrier clearings.*

Four papers on these subjects were before the Conference, viz.—Appendix iii by the Director of Medical Services, Uganda ; Appendix v by The Director of Veterinary Services, Uganda ; Appendix ix by E. A. Lewis of the Veterinary Research Division, Kenya ; and Appendix xiii by the Tsetse Research Department of Tanganyika. After a lengthy discussion of these matters it was resolved that :—

“ The Conference, having heard the details of work on tsetse bionomics and control carried out during the past two years, considered that study should be pursued along all these lines, special attention being directed to trapping, the use of chemical baits in traps, and the influence of changes of physical environment under laboratory and field conditions. It also recommended that, in view of the short time the work in the Lambwe Valley had been in hand and its great importance, it should be continued at least until the next meeting of the Conference.

“ The Conference noted the value of work carried out by Dr. Mellanby at the Human Trypanosomiasis Institute, Entebbe. It regretted that owing to the expiry of his grant he was compelled to return to Europe, but hoped that efforts would be made to ensure continuance of investigations on the lines on which he has been working.”

ix.—*Investigation of the prophylactic value of Bayer 205.*—The Chairman read an extract of Duke's papers on this subject which appears as Appendix xiv. In the discussion which followed, Fairbairn, commenting on Duke's statement that cryptic infections may occur after the use of Bayer 205 as a prophylactic, stated that he had never yet seen cryptic infections caused by *T. rhodesiense*. The Conference noted the important observations recorded by Dr. Duke on the prophylactic use of Bayer 205, but while recognizing its value considered that the question of cryptic infections should receive further investigation ; it believed it advisable to await the result of further field experiments in Uganda and elsewhere before advocating the use of Bayer 205 as a prophylactic agent on a large scale.

x.—*Further investigation of identity of T. uniforme.*—Three papers on this subject were before the Conference, viz. Appendices ii, iii and iv. The Conference agreed that this question should be investigated as and when opportunity permits.

xi.—*Investigation of bionomics of T. brucei.*—After discussion the Conference recorded the desirability of further investigation of the point, but did not consider it could be included in the current programme of research.

xiii.—*Cultivation of T. congolense and T. vivax on artificial media.*—It was agreed that this item should be deleted from the research programme.

xiv.—*Trypanosomiasis of pigs.*—Reference to this subject is contained in Appendices ii, iii and iv. After some discussion it was decided to delete this matter from the programme of research.

xv.—*Course of T. rhodesiense infection on the larger antelopes.*—It was considered that this subject had been covered during the discussion in Item iii.

xvi.—*Pathology of Rhodesian sleeping sickness.*—A memorandum on this subject by Dr. Calwell is contained in Appendix xi. In the discussion on this paper Fairbairn stated that he thought it unlikely that material for pathological investigation would be available from untreated cases of sleeping sickness. The Conference emphasized the importance of the investigation of the pathological anatomy of cases of trypanosomiasis, both animal and human, and recommended that arrangements should be made whereby workers on trypanosomiasis could be put in touch with experienced pathologists in Europe who would be prepared to undertake the investigation of post-mortem material.

xvii.—*Infectibility of G. brevipalpis with T. rhodesiense.*—The Conference noted Dr. Calwell's work (Appendix x) on the infectibility of *G. brevipalpis*, and understood that an endeavour would be made to carry out further investigations along these lines in the coastal areas of Tanganyika.

The Conference then turned to a consideration of a number of items not in the Agenda. These were :—

1. *Chemotherapy of animal trypanosomiasis.*—Several papers dealing with this matter were before the Conference, viz., Appendices ii, iii, iv, vii and viii. Mettam, Daubney, Hornby and Bennett took part in the discussion, and it was decided to record that the Conference noted the work which had been carried out since the last meeting of the Conference, and considered that, in view of the success which has attended tests of Surfen C. in *T. congolense* infections, further investigations of trypanocidal compounds should be made, and that this drug particularly should receive further study.

2. *Examination of resistance to human serum in vitro of T. brucei and T. rhodesiense.*—The Conference recommended that in view of the fundamental importance of devising a method of differentiating *T. brucei* from *T. rhodesiense*, experimental work be carried out to determine the resistance to human serum, using Warrington Yorke's *in vitro* technique, of a large number of strains of *T. brucei*. Such work would necessarily be conducted in a *T. rhodesiense*-free country. The Conference suggested that Zululand might prove suitable for the purpose. It further recommended that the possibility of the work being put in hand be examined by the Tanganyika Government.

Other matters discussed were :—The transmission of *T. congolense* by *G. palpalis*; The influence of the plane of nutrition on trypanosome infection; Animal reservoirs of *T. rhodesiense*; and Distribution of reports. With regard to the last item the Conference agreed to recommend :—

“(1) That the Governors' Conference be approached with a view to the establishment of machinery for the circulation of reports in connection with Human and Animal Trypanosomiasis throughout the East African Territories and the Sudan.

- "(2) that heads of departments should be requested to circulate information to other East African territories at regular intervals, giving the names of officers conducting investigations in their departments."

The delegates then considered the question of the period which should elapse between meetings, and as the result of their deliberations :

"The Conference recommended that meetings should be held at two-yearly intervals and that the next one should be held in Tanganyika Territory in association with that on the Co-ordination of General Medical Research.

"The Conference agreed that the arrangement of the agenda for the next meeting and the collection of progress reports should be left to the Advisory Medical Research Committee—suggested by the Conference on General Medical Research (if appointed)—and to the Co-ordinating Committee on Veterinary Research, liaison being maintained with the Tsetse Research Department, Tanganyika."

Summary of programme of tsetse and trypanosomiasis research, 1936-37.

<i>Item of Research.</i>	<i>Where to be carried out.</i>
1. Testing of the Entebbe Laboratory Strains of <i>T. brucei</i> and <i>T. rhodesiense</i> for Infectivity to Cattle	<i>b</i> and <i>d</i>
2. Relative Resistance of Zebu and Ankole Types of Cattle to <i>T. brucei</i>	<i>a</i>
3. Transmission of <i>T. brucei</i> , <i>T. rhodesiense</i> and <i>T. congolense</i> to Cattle by <i>G. palpalis</i>	<i>a</i>
4. Existence of Other Reservoirs than Man for <i>T. rhodesiense</i>	<i>c</i>
5. Retention of the virulence of <i>T. gambiense</i> after Transmission by <i>G. morsitans</i> in Monkeys	<i>c</i>
6. Arsenic Resistance in Strains of <i>T. rhodesiense</i> and <i>T. gambiense</i>	<i>c</i>
7. Bionomics of Tsetse Fly	Work now carried on in various Territories to be continued.
8. Control of Tsetse Fly	Ditto.
9. Field experiments on Bayer 205 Prophylaxis	<i>e</i>
10. Infectibility of <i>G. brevipalpis</i> with <i>T. rhodesiense</i>	<i>f</i>
11. Investigations on Trypanocidal Compounds	<i>a</i> and <i>b</i>
12. Differentiation of <i>T. brucei</i> from <i>T. rhodesiense</i> by resistance to Human Serum <i>in vitro</i>	<i>f</i>
13. Influence of Plane of Nutrition on Trypanosome Infections	<i>b</i>
<i>a</i> —Veterinary Laboratory, Entebbe.	<i>d</i> —Veterinary Department, Khartoum.
<i>b</i> —Veterinary Laboratory, Mpwapwa.	<i>e</i> —Uganda Medical Department.
<i>c</i> —Trypanosoma Rhodesiense Laboratory, Tinde.	<i>f</i> —Tanganyika Medical Department.

W. Yorke.

GILKES (Humphrey). **The Investigation of an Outbreak of Sleeping Sickness in Northern Rhodesia.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 213-222. With 1 map.

— **Sleeping Sickness in the Mumbwa District.**—*Northern Rhodesia Med. Rep. on Health & Sanitary Conditions for Year 1935.* Appendix I. pp. 31-38.

This investigation concerning the incidence of sleeping sickness in the Hook of the Kafue River was undertaken in order to answer certain questions raised by the district administration.

The area in question lies to the west of the Livingstone-Broken Hill Railway and is bounded on the north, west and south by a hook which the Kafue river makes before it flows eastward to the Zambesi. Mumbwa, the seat of administration, lies at the centre of the hook ; it is a little over 100 miles from Mumbwa to the tip of the salient.

As is shown in an accompanying map the northern part of the hook is a game reserve, though scattered villages were situated there at the time of the investigation ; the southern half is a native reserve. It is proposed to build a road from Mumbwa to the tip of the salient and aerodrome, running between the game reserve and the native reserve, and it is intended that the villages of both Area I and Area II (in the game reserve) shall be moved into new sites in the native reserve.

Reports of suspected cases of sleeping sickness have been received from this district for more than 10 years. The year 1935 saw a great increase of such cases, but it was, for reasons stated, difficult to decide how many were really sleeping sickness. Therefore, with the exception of the small group of villages in Area I, in which 25 suspected deaths occurred during the year and in which the natives had obviously learned from experience of many cases, reports were not considered reliable.

The course of the journey made by the author is indicated by the dotted line on the map. Observations are recorded on the native tribes collected in this rather sparsely populated area, on the type of vegetation, and on the game and tsetse (*G. morsitans*). During 1935 there were 29 cases of the disease diagnosed microscopically ; 9 were found during the investigation and the remaining 20 were diagnosed from slides of blood and gland juice sent for examination. The distribution of these cases is discussed in some detail. Examination of the recent movements of the cases suggests that the game reserve, and particularly Area I, is the original source of infection. The remedy appears to be the evacuation of the villages of Areas I and II combined with the usual grouping of the villages in contiguous areas, and clearing. After much deliberation by the chiefs, the Administration and the Medical Department, the areas marked IA and IIA were chosen as the new sites for the evacuated population.

The author answers the questions raised by the District Administration as follows :—

1. *The endemicity or epidemicity of the disease :*

The disease is endemic. It is carried by *Glossina morsitans*. Nine cases existed in the area in December, 1935.

2. *The liability of travellers to infection and the possibility of control of the routes :*

This liability will always exist, both for Europeans and natives. The worst routes for natives pass through the game reserve and these will automatically be closed by the removal of all the villages. The Government stations further west should warn natives of the disease, and tell them that there are now no villages in the game reserve and that the area is closed. No cordon is necessary as the disease is not an epidemic.

3. *The desirability of opening the game reserve as a tourist attraction :*

This would be wrong until at least 10 years have elapsed.

4. *The question of evacuating the native reserve also :*

This is unnecessary. The cases found in the native reserve were probably, though not certainly, infected in the game reserve. Sleeping sickness is now endemic in northern villages of the native reserve, but the measures suggested should keep it in check and it is hoped eventually to reduce it to a very occasional case.

5. *Consideration of the best areas to which the natives now in the game reserve should be moved :*

After considerable discussion the areas marked Area IA and Area IIA have been chosen as most suitable under the circumstances.

6. *The best position for a native dispensary :*

This has been sited at the Chief's village in Area IIA. It could be reached by a branch road.

7. *The native cotton industry :*

This will be unaffected, provided that the west road is built.

8. *The advisability of building this contemplated west road through the sleeping sickness area :*

There is no reason why a road should not be built. Its course was sited during the tour of investigation so that it would pass through no villages and avoid infected areas. It should prove of immense value to the whole district. If the question is asked "Is there any danger to the Europeans and natives who build it?" the answer is "Yes," but they could be protected to a certain extent by prophylactic doses of Bayer 205 and suitable clothing. The native labour, could, moreover, be recruited locally and local natives would run no more danger than in their normal journeys from village to village. It is, of course, important to establish efficient fly-posts on the new road to prevent cars and lorries from carrying the tsetse fly into Mumbwa.

9. *The question of building an emergency landing ground and its best situation from the sleeping sickness point of view :*

This was sited near the pontoon which will carry the new west road over the Kafue River. A single village will be left there as caretakers of the river crossing. There have been no reports of sleeping sickness in this village and no cases were found there. There are no tsetse fly near and the surroundings of the village are clean and well cleared. W. Y.

GOLD COAST: REPORT ON THE MEDICAL DEPARTMENT FOR THE YEAR 1935. Appendix IV. pp. 78-84.—Report of the Committee on Human Trypanosomiasis [JACKSON (F. W. F.), Chairman].

The Committee was appointed by the Governor to discuss the problem created by the apparent increase in the prevalence of human trypanosomiasis. The terms of reference were :—

(a) To advise as to the best means of combating human trypanosomiasis.

(b) To consider the existing legislation on the subject and to advise whether any revision is necessary.

The report is divided into three parts, the first of which deals with general observations.

The Committee does not consider that the present situation throughout the Colony need give rise to undue concern. The disease is undoubtedly a drain upon the people and can, in certain circumstances, become dangerous, but there is, on the whole, no cause for panic. Although hospital figures show a relatively considerable increase in the number of cases treated, this does not necessarily mean that there has been a serious increase in the incidence of the disease among the people of the Gold Coast. There have, however, been isolated outbreaks in a few areas such as Mamprusi. Various factors explain the rise in number of cases treated, e.g., better diagnosis, more efficient treatment, and greater confidence among the natives. The Committee stresses the need for gradual enlightenment of the African by means of persistent (not blatant) propaganda.

Notwithstanding the foregoing remarks there has probably in recent years been a slight increase in the prevalence of the disease. In the most seriously infected focus, which lies in the Northern Territories, the incidence varies between 4 and 10 per cent. In Ashanti the incidence is not so high, the percentage of infection in Northern Ashanti being about 0.6.

In the Northern Territories the usual vector is *G. palpalis*, although *G. tachinoides* is quite common. In the forest zone (Ashanti) *G. palpalis* is again the chief menace, but *G. longipalpis* is also found. The report then refers to such matters as clearing, legislation, treatment and trypanosomiasis of cattle.

The last two parts of the report are devoted to recommendations for dealing with the situation in the Northern Territories and in Ashanti, respectively.

W. Y.

DUKE (H. Lyndhurst). **Studies of the Effect on *T. gambiense* and *T. rhodesiense* of Prolonged Maintenance in Mammals other than Man; with Special Reference to the Power of these Trypanosomes to infect Man. I & II.**—*Parasitology*. 1936. July. Vol. 28. No. 3. pp. 381–390. [13 refs.]; pp. 391–394.

Duke states that the main theme of this series of papers will be the power of the *brucei* group of trypanosomes, *T. brucei*, *T. rhodesiense* and *T. gambiense*, to infect man. This problem is bound up with two others of practical importance, viz. (1) Can the African big game serve as reservoirs for human trypanosomiasis?; and (2) What are the affinities existing among these three trypanosomes? It is the author's intention to attempt to summarize knowledge on these matters and particularly to state as definitely as possible the position reached by the investigations carried out at his own Institute at Entebbe. The following subjects will be considered: *T. gambiense* in ruminant game; the effect of prolonged maintenance away from man on the infectivity of *T. gambiense* for man. Similarly with *T. rhodesiense*; the infectivity of wild *T. brucei* for man; some observations on Bevan's "Kahondera" strain from Rhodesia; and lastly a summary of the position as it appears to Duke.

The first paper of the series deals with the question of *T. gambiense* in ruminant game. After reviewing the very scanty literature on the subject (BRUCE *et al*, 1911, Duke, 1912 and 1928) the author describes certain recent observations made by himself in which 3 situtunga, 2 oribi, 1 reedbuck and a hybrid between bushbuck and situtunga were exposed to infection with *T. gambiense*. Of the 3 situtunga, one developed a transient infection, but the trypanosome failed to infect the glands of any of 1,068 *G. palpalis* which were fed on the situtunga; the other two situtunga failed to become infected. Both oribi became infected and from one of these *G. palpalis* was infected; the animals apparently did not suffer severely as the result of the infection. The reedbuck appears to have developed a temporary infection without any serious result, and the hybrid failed to become infected.

It is important to note that in the experiments cited in this series of papers the animals were infected, whenever possible, by cyclically infected *G. palpalis*, either directly by their bite or indirectly by the inoculation of the infected salivary gland.

These observations show that *T. gambiense* is but poorly adapted to life in the species of antelope chosen. Duke reaches the general

conclusion that *T. gambiense* in ordinary circumstances depends mainly on man and perhaps, but to a much less degree, on his domestic animals for survival in nature. It is most improbable that game animals are a danger in the spread of this trypanosome in nature. Even if *T. gambiense* infects these animals it is prone to lose quickly its power of developing in the fly.

In the second paper are collected all the instances recorded at the Entebbe laboratory of testing *T. gambiense* on man after the trypanosome had been maintained for a time in laboratory animals. The history of each of the strains tested is given.

The conclusions reached are :—

"Of 7 strains of *T. gambiense* tested in man after maintenance for various periods away from all contact with man, 6 retained apparently unimpaired their power of infecting him, although the number of volunteers employed with some of the strains was small.

"The seventh strain failed to infect on 3 occasions and with 3 different volunteers, but infected 4 others.

The Infectivity of "Wild" T. brucei for Man.

"The following is a brief summary of the tests carried out with *T. brucei* at the Entebbe Institute. Two new strains have been tested since the last publication on this subject.

"(1) *T. brucei*. Strain LVI (*a*, *b* and *c*); these 3 strains, recovered from wild *G. palpalis* on Damba Island, Lake Victoria, were tested on 4 volunteers (1 European and 3 natives). The men were exposed freely to laboratory-bred *G. palpalis* infective with these strains, and in no case did infection of man occur (Duke, 1935).

"(2) *T. brucei*. Strain LIII; from the Kazinga channel in Western Uganda (*G. pallidipes*). A fly infective with this strain but failed to infect a volunteer.

"(3) *T. brucei*. Strain LV; from the *G. morsitans* country in the vicinity of the Murchison Falls on the Victoria Nile, in the Northern Province of Uganda. Four gland-infected flies bit a volunteer but failed to infect him.

"(4) *T. brucei*. Strain LVII; from the *G. pallidipes* country on the north-east shores of Lake Victoria. Flies infective with this strain failed to infect a volunteer.

"(5) *T. brucei*. Two strains recovered from a *G. palpalis*-infested shore-line of Lake Victoria, near Entebbe. The strains were obtained in monkeys by exposing the animals to the bites of wild tsetse. The citrated blood of these monkeys was then inoculated into a volunteer, who did not become infected. Control animals inoculated at the same time became infected with *T. brucei*."

The paper ends with a summary of the tests carried out at the Entebbe Institute on the infectivity of "wild" *T. brucei* for man.

[For a more detailed account of most of the experiments mentioned in this paper see this *Bulletin*, 1935, Vol. 32, p. 688]. W. Y.

DUKE (H. Lyndhurst). **Antelopes as Reservoirs of *Trypanosoma gambiense*.** [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. June 30. Vol. 30. No. 1. pp. 129–131.

This is a reply to CORSON's recent letter on the subject of antelopes as reservoirs of *T. gambiense* [this *Bulletin*, 1936, Vol. 33, p. 667]. Duke writes that he himself, and not Bruce's Commission, must be held responsible for the final conclusions referred to by Corson. He is satisfied that there is no reason whatever to doubt the correctness of the earlier experiments, and that the investigation as a whole showed

that *T. gambiense* may survive for a long period in antelope. Duke states that he is reviewing the whole subject in a paper which is now in the press [*vide* above].

W. Y.

LLOYD (Ll.). **Assessment of a Tsetse Population.**—*Bull. Entom. Res.* 1936. July. Vol. 27. Pt. 2. pp. 261–267. With 1 fig.

In the experiments described in this paper *G. tachinoides* in an isolated secondary focus around the Road Pond at Sherifuri, Nigeria, were marked with distinctive colours during 13 successive weeks, and the fate of the groups studied by recaptures. On the first three days of each of the 13 successive weeks, collections of *G. tachinoides* were made in the secondary focus. At the end of each collection the flies were marked with a bold spot of oil paint on the dorsum of the thorax, and passed through a bung-hole into a large wooden box provided with a muslin cover. The box was then placed in a fixed spot in the thicket with the muslin cover darkened and the bung-hole open, so that the flies could find their way out. A distinctive paint was used each week, and flies caught bearing marks were released without further marking. The individual marked fly might thus be caught on several occasions, but the intention was to keep the colony as intact as possible. The fly boys were instructed not to collect in the immediate neighbourhood of the release, so that the marked flies recaptured had again become part of the general population.

The fly population of the focus was known to be declining from moderate density to great scarcity through the dry season, and the wastage in the colour groups on the average proved to be 11.5 per cent. per diem; this was probably rather greater than the wastage in unmarked flies. Following Jackson's method of assessment the population was shown to fall from 6,000 at the end of October to 400 by mid-January. The ratio of the boy-hour rate to these numbers is worked out for each collection, and it is found that when the boy-hour rate is above 50 it is not relative to population, but below 50 the rate falls as the population, allowing for the influence of weather on rate of catching.

Under the conditions of the experiment, there was an almost complete change of fly population each 5 or 6 weeks, although an occasional fly may survive for 11 weeks. The population of male flies in the catches fell with increasing age from an initial 57 per cent. to 23 per cent. in the 6th week, and no male fly surviving this period was caught.

W. Y.

ROUBAUD (E.) & COLAS-BELCOUR (J.). **Observations biologiques sur les glossines (*Gl. palpalis*, *Gl. morsitans*).** [**Biological Observations on Glossina (*G. palpalis*, *G. morsitans*).**]—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 691–696. With 2 figs.

This paper records a number of observations made in the Institut Pasteur on *G. palpalis*, the pupae of which were sent by DUKE by air mail from Uganda in mid-winter. The pupae were placed in an incubator with a moist atmosphere (70 per cent.) at a temperature of 25°–28°C. during the day, but sometimes exceeding 32°C. at night. A few hours after their arrival the pupae began to hatch. It was observed that about two-thirds (2,319) of the pupae failed to hatch, and that a large number (500) of liberated flies, which were not fully

developed, died immediately. Only about 250 pupae liberated normal flies which could be kept alive for some time. Among the 515 flies which failed to develop their wings and died almost immediately 149 (28.9 per cent.) were males and 366 (71.1 per cent.) were females; whilst amongst 58 flies which developed normally 40 (68.9 per cent.) were males and 18 (31.1 per cent.) were females.

These facts show that the female in the pupal state is much more sensitive to unfavourable conditions than is the male. The phenomenon is not peculiar to *G. palpalis*, but applies equally to *G. morsitans*. Flies were bred in Paris uninterruptedly for 3 years, but the process was finally ended by "spanogynie," or complete disappearance of the females, only males hatching from the pupae. The authors inquire whether this is not the explanation of the curious separation of the sexes which had been observed from time to time (ZUPITZA, ROUBAUD, STUHLMAN, etc.) in natural foci of *Glossina*, in which males were found almost exclusively.

The authors next pass to an examination of the factors which are responsible for the sterility of the females under unfavourable climatic conditions. Previous work has already shown that under the influence of abnormal thermic and hygrometric conditions there is retention of eggs in the ovary and premature expulsion of larvae. The present investigation showed, however, that another anomaly of a different kind also plays a part. This is the absence of fertilization, notwithstanding frequent couplings. The failure of fertilization is perhaps due to destruction of the spermatozoa in the genital passages of the female before they reach the spermathecae, where, under normal conditions, they live for a long time.

It is known that *Syntomosphyrum glossinae* Wtrst, parasitizes the pupae of various species of *Glossina*, and especially those of *G. palpalis*. Two or three of the pupae received from Uganda harboured the parasite, and its development was followed experimentally in the pupae of *Musca domestica*.
W. Y.

BUXTON (P. A.). Studies on Soils in Relation to the Biology of *Glossina submorsitans* and *tachinoides* in the North of Nigeria. With an Appendix by K. MELLANBY.—Bull. Entom. Res. 1936. July. Vol. 27. Pt. 2. pp. 281-287. With 1 fig.

The author points out that there are many facts indicating the importance of soil in the life of *Glossina*. During his work in the north of Nigeria in 1933, he found reason for believing that the humidity of the atmosphere in the soil may act as a limiting factor upon the puparia of *G. tachinoides* and *G. submorsitans*. It was found that of pupae exposed *in vitro* at a continuous low humidity only a small proportion hatched. It was also shown that many of the puparia exposed to the lower humidities died within a few days; the rest lived through the normal period, but the resulting flies were unable to rupture the puparial skin and died within it. These unfavourable effects of low humidity were unexpected because the country surrounding the laboratory was extremely hot and dry, and flies of the two species were common and there was no evidence of high mortality among puparia in nature.

From observations of this sort Buxton concluded that the relation of puparia to soil should receive much more attention than it has in the past. The experiments described in this paper show that the soil

of the thickets (unlike the more sandy soil of the open country) will take up large quantities of water ; as its colloidal content is high this soil must also possess a great power of retaining the water. Furthermore, even when the soil seems quite dry (water content 4 per cent.) the atmosphere in the soil spaces is very nearly saturated. Although it is not proved, Buxton thinks it likely that the soil atmosphere in the north of Nigeria, even under extreme conditions of heat and drought, may not be so dry as to be unfavourable to the puparia of *Glossina submorsitans* and *G. tachinoides*.
W. Y.

NASH (T. A. M.). **The Relationship between the Maximum Temperature and the Seasonal Longevity of *Glossina submorsitans*, Newst., and *G. tachinoides*, Westw., in Northern Nigeria.**—*Bull. Entom. Res.* 1936. July. Vol. 27. Pt. 2. pp. 273–279. With 2 figs.

The two experiments described in this paper were designed to elucidate the seasonal fluctuations in longevity for *G. submorsitans* and *G. tachinoides*.

The following summary is given :—

" 1. There is considerable seasonal variation in the longevity of *G. submorsitans* and *G. tachinoides*, and these variations are negatively correlated with the fluctuations in the maximum temperature curve, i.e., as the temperature rises longevity decreases, as the temperature falls so longevity increases.

" 2. The cycle is as follows : The rains commence and temperature falls, longevity increases and remains high throughout the rains. The wet season ends, temperature rises and longevity decreases. The cold spell intervenes and longevity becomes maximal. The cold weather ends, the temperature soars up and longevity becomes minimal, remaining low until the new rains commence.

" 3. Maximum temperature is considered to be the dominant factor ; favourable humidity cannot increase longevity unless the maximum temperature is favourable.

" 4. The oldest individuals occur in the rains, but the average longevity is highest in the cold season, when both temperature and humidity are favourable.

" 5. In both species females tend to live longer than males.

" 6. In the field *G. tachinoides* males appear to live rather longer than the males of *G. submorsitans*.

" 7. It is doubtful whether wild flies of either species live much more than 2½ to 3 months under the most favourable conditions ; it is probable that in the hottest weather longevity is curtailed to a month or less, and that the production of puparia is seriously affected when the rains are late and the hot weather is prolonged."
W. Y.

NASH (T. A. M.). **The Part Played by Microclimates in enabling *Glossina submorsitans* and *G. tachinoides* to withstand the High Temperatures of a West African Dry Season.**—*Bull. Entom. Res.* 1936. July. Vol. 27. Pt. 2. pp. 339–345. With 2 plates.

In a recent paper a description was given of experiments upon the effect of high maximum temperatures upon the longevity of *G. submorsitans* and *G. tachinoides* [this *Bulletin*, 1935, Vol. 32, p. 723]. The present paper carries the investigation further, and the author gives the following summary of the results :—

" 1. It has been confirmed that the lower limit of the critical zone, for fly of medium age, is 102°F. for both species ; this limit is probably even lower for very old *G. tachinoides*.

" 2. The adverse effect upon the fly community of a day when the maximum temperature enters the critical zone is continued among the older individuals for several days following, even though the maximum temperature on these days remains below the lower limit.

" 3. From the mean maximum temperatures recorded over 52 days in 9 microclimates, it would appear that sites on the ground are cooler than those above the surface; the difference is not very great, the mean for the four ground sites being only 4.4°F. lower than the mean for the five above-ground sites.

" 4. The evidence suggests that on very hot days only the ground within the true forest is safe for tsetse; in all other sites—above the ground in the true forest or on the ground in the intrusive and peripheral thickets—the temperature is liable to enter the critical zone, and may even reach the upper fatal limit.

" 5. The tsetse community is living very close to the critical zone in the late dry season. Even the coolest ground site yielded an absolute maximum that was only 3.5°F. below the lower limit.

" 6. Site no. 9 gives an indication of how severe the conditions might become in the true forest were the windbreaks of peripheral and intrusive thicket removed.

" 7. In ground sites a shower of rain produces about twice as great an initial drop in temperature, and temperature remains abnormally low for about twice as long, as it does for sites above the surface of the soil.

" 8. The duration of the period of dangerously high temperatures to which the fly community is subjected in the late dry season may be very varied; it depends upon the incidence of rain in April and May." W. Y.

MOGGRIDGE (J. Y.). **Experiments on the Crossing of Open Spaces by *Glossina swynnertoni*.**—*Bull. Entom. Res.* 1936. Sept. Vol. 27. Pt. 3. pp. 435–448. With 4 figs.

The experiments described in this paper were undertaken in order to ascertain the extent to which *G. swynnertoni* is capable of crossing an open space from fly-infested bush when carried (1) by game, (2) by cattle and man, and (3) by man alone.

The author later passes to an investigation of the maximum time that this tsetse fly could be carried on man and on cattle across an open space, and to obtaining information regarding the distance at which a target moving in the open will attract tsetse to it from the bush.

The following is a summary of the conclusions reached :—

" (1) A party of five men and three oxen walking through long grass and under dry season conditions failed to attract fly (*G. swynnertoni*) to them from fly bush at a distance greater than 100 yards.

" (2) The average number of flies attracted out to the party when passing at a distance of 100 yards from the edge of the fly bush for an average time on each occasion of 17 minutes was approximately eight flies.

" (3) Of the total of 61 flies captured on the 100 yards transect 59 flies were captured off the cattle.

" (4) A marked fly preference was shown for two of the oxen; only 3.39 per cent. of the flies taken off the oxen were captured from the third ox.

" (5) In a similar set of five experiments made later in the dry season over ground which had been partly burnt, giving conditions of excellent visibility, a party composed of four men and three oxen failed to attract more than a few flies from the bush edge. Out of a total of 17 flies captured one was taken at 300 yards, four at 200 yards, and twelve at 100 yards. The average time taken to complete the 100 yards patrol in this set of experiments was 14 minutes.

" (6) The flies were shown on two occasions to be in considerable density on the edge of the bush adjacent to the transects." W. Y.

MOGGRIDGE (J. Y.). **Some Observations on the Seasonal Spread of *Glossina pallidipes* in Italian Somaliland with Notes on *G. brevipalpis* and *G. austeni*.**—*Bull. Entom. Res.* 1936. Sept. Vol. 27. Pt. 3. pp. 449–466. With 18 figs. on 3 plates & 1 text fig. (map).

Glossina palpalis has long been known to exist in the great tsetse belts of Central Tanganyika, but, owing to its relative scarcity, it has not attracted the same attention and study which has been devoted to *G. morsitans* and *G. swynnertoni*. As it is probable that any large reclamation measures directed towards the elimination of the latter flies will have to contend also with the population of *G. pallidipes*, the author decided to undertake an investigation on the ecology of that fly. As a preliminary to work on this subject in Tanganyika, he spent a month in investigating the ecology of *G. pallidipes* in Italian Somaliland.

The following summary is given :—

" The only species of tsetse to be found on the Uebi Scebeli is *Glossina pallidipes*, which concentrates in confined areas during the dry season. The fly increases in numbers in the wet season and spreads over the surrounding country to a maximum depth of 6 miles (10 kilometres).

" 2. The presence of deciduous thicket seems an essential constituent of the vegetation forming the true habitat and breeding-place of *G. pallidipes*, and high humidity and shade are essential in the areas over which the fly spreads in the wet season, it being capable of spreading through inhabited and cultivated areas during the wet season.

" 3. *G. pallidipes* is not able to maintain itself permanently under conditions of comparatively low temperature and high humidity in vegetation, of which the dominants are *Acacia arabica* and *A. Benthamii*, in the absence of deciduous thicket types.

" 4. Breeding is confined to areas of deciduous thicket, preference being shown for horizontal growing trees and for logs rather than for the bases of thicket types.

" 5. *G. pallidipes* is capable of being carried considerable distances by natives bearing loads.

" 6. *G. pallidipes*, *G. brevipalpis* and *G. austeni* are found on the River Juba.

" 7. In the Juba area *G. pallidipes* flourishes in deciduous thickets, while *G. brevipalpis* is found in great density in the rain forests, in which *G. austeni* is also encountered.

" 8. A fungus pathogenic to tsetse is present in the Alessandra fly area."

W. Y.

BURTT (Eric). **A Simple and Rapid Method for Extraction of the Salivary Ducts of Tsetse-Fly, suitable for Trypanosomiasis Examinations.**—*Ann. Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. p. 265.

A simple modification of Lloyd and Johnson's method is described, which the author claims to have the advantage, not only in the possibility of a higher percentage of duct extraction, but also that any necessity of observing or handling the fine threads of the ducts themselves during the operation is obviated. The method is as follows :—

" The chloroformed fly is held in the hand, and the legs are snipped off with the scissors. A fine pin is then inserted through the pleuron of the thorax at an angle of roughly 45°. By means of this pin the fly is fixed

and completely immersed, ventral side uppermost, in normal saline contained in a small dissecting-dish, having a layer of paraffin wax at the base, and of dimensions suitable for placing on the microscope stage. A second pin is similarly inserted through the pleuron of the other side of the thorax, so that the fly is firmly held in position on the wax. The abdomen of the fly is now snipped off, in the saline, with fine scissors.

"A slide having been placed in readiness, with a drop of saline on it, the fly is then examined under the dissecting microscope. If the palps still adhere to the proboscis, it is as well to separate them from it with a needle. The proboscis is then gripped with fine forceps along its length, right down to the bulb expansion at its base, and a gentle and steady pull is given until it is removed. Whilst the pull is being exerted, the object is observed under the microscope, and great care is taken that the attachments of the proboscis give way gently and steadily, and not with a sudden jerk, the force exerted with the forceps being regulated accordingly.

"The proboscis is then completely removed and mounted on the slide, and the salivary ducts will be found still attached to it and ready for examination."

W. Y.

CORSON (J. F.). **A Second Note on a High Rate of Infection of the Salivary Glands of *Glossina morsitans* after feeding on a Reedbuck infected with *Trypanosoma rhodesiense*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 207-212.

In a recent paper [this *Bulletin*, 1935, Vol. 32, p. 709] the author recorded experiments in which the rates of infection of the salivary glands of *G. morsitans*, which had fed on a reedbuck, infected with *T. rhodesiense*, were 60 and 33·3 per cent., respectively; the rate in a control experiment with a monkey was only 1·1 per cent. In a further control experiment sheep were infected by flies from the reedbuck, but flies fed on these sheep developed but few (2·7 per cent. or less) salivary gland infections.

The reedbuck used in these experiments was darker and greyer than the kind usually seen in the Tinde district and is known locally by the name of "mongee," whereas the usual variety is called "njaa." In December, 1934, not long after the "mongee" experiment, flies were fed on an infected njaa, but here only 6 per cent. of salivary gland infections were obtained.

On December 24th, 1935, another young specimen of "mongee" was brought to the laboratory, and it was decided to infect the animal with *T. rhodesiense* and then to feed *G. morsitans* upon it to see if a high rate of salivary gland infections would be again obtained. Details of the experiment are given. Three batches of flies were used: the 60 survivors of the first lot were killed and dissected 28 days after the first infecting feed and 26 (43·3 per cent.) of gland infections were found; the second lot killed 24 days after the first infecting feed showed that 16 (64 per cent.) of the 25 survivors had gland infections, and the third lot killed at the same time, consisting of 6 flies, showed one gland infection. Altogether, therefore, 43 of the 91 flies, or 47 per cent., had infected salivary glands. This is in striking comparison with the results obtained with other animals infected with the same strain of *T. rhodesiense*, details of which are given in a table.

The paper closes with the following summary:—

"Another instance of a high rate of infection of the salivary glands of *G. morsitans*, after feeding on an infected reedbuck, is recorded: and it is suggested that the species of animal may be a determining factor in the rate of infection of the flies. Some other figures are given for comparison.

Robertson's views on an endogenous cycle of *T. gambiense* in monkeys are referred to and the opinion is expressed that they are not applicable to infections with *T. rhodesiense*. It is suggested that surveys of animals in sleeping sickness areas are needed and also further experiments with single animals and with groups of animals." W. Y.

CARPENTER (G. D. H.). **Observations by Mr. T. W. Chorley, F.R.E.S., on Dragonflies attacking the Tsetse Fly, *Glossina palpalis* R. D.—***Proc. Roy. Entom. Soc. London.* 1935. Vol. 10. pp. 78–79. [Summarized in *Vet. Bull.* 1936. Sept. Vol. 6. No. 9. p. 717.]

"CHORLEY reports that while visiting Kome Island on Lake Victoria he observed dragon-flies attacking *G. palpalis* in clearings on the foreshore. The dragon-flies followed natives and darted swiftly on any tsetse flies that alighted to feed, immediately devouring the engorged entrails. No other flies were attacked. Tsetse flies were not followed into the forest, where they were abundant. In the clearings where they were attacked they were scarce."

CORSON (J. F.). **The Influence of Repeated Transmissions in Animals on the Virulence of *Trypanosoma rhodesiense* and *Trypanosoma brucei*.—***Ann. Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. pp. 211–220. [10 refs.]

Corson discusses the influence on polymorphic trypanosomes of maintenance by direct passages, as used in laboratories where tsetse cannot be obtained; he reaches the conclusion that little is known about the subject.

With the object of throwing some light on the matter he considered it useful to examine records of transmissions of some freshly isolated strains of *T. rhodesiense* and *T. brucei*. As polymorphism and the production of posterior-nuclear forms were not lost in any of the strains personally studied (*i.e.* all but two) attention was limited to virulence, and the duration of life after infection was taken as a rough measure of virulence for a species of animal.

In the case of one strain (*T. rhodesiense*, Kibondo), transmissions were made by single isolated *G. morsitans*, except the first passage, and rats were infected from time to time by these single flies, so that the date of their infection was known. Three of the strains were transmitted through goats and sheep, while occasional passages through guineapigs, birds and hyrax appear in the records.

When transmissions were made through rats only, there was an increase in virulence in most strains, but this was not evident in sheep and goats. In the strain, *T. rhodesiense*, Kibondo, there was no clear indication of any stabilizing action of repeated fly-passages, as judged by the infection in test rats. The records are set out in a series of tables, which must be studied in the original by those interested.

W. Y.

POINDEXTER (Hildrus A.). With the Technical Assistance of Robin I. BENNETT. **Some Observations on the Nature of the Thermo-precipitation Reaction in *Trypanosoma equiperdum* Infection.—***Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 485–492.

In a previous paper the author has shown that extracts of the spleen of rats, guineapigs and rabbits infected with *T. equiperdum* contain a

thermoprecipitinogenic substance [this *Bulletin*, 1935, Vol. 32, p. 362]. In his previous work three questions remained unanswered: (a) What is the nature of the thermostable substance and the nature of the reaction? (b) What tissue or organ extracts of the body give the better results and why? (c) What laboratory animal produced the best extracts, and what animal showed the highest titre of immune serum? The present article reports the results of experiments in which an attempt is being made to answer these questions. The following are the summary and conclusions:—

"The nature of the thermostable extracts from the tissues of *T. equiperdum* infected animals appears at least to be a co-mingled protein, even though a large portion of it may be carbohydrate.

"The extracts of the tissues of the organs that are more active in hemopoiesis and hemoclasia contain the greatest amount of the thermoprecipitinogenic substance.

"The extracts of the spleen and lymph node of young offspring of infected guinea pigs' mothers give a positive reaction while the bone and marrow and heart muscle extracts give negative results.

"The titer of immune sera from infected rabbits was higher than from other infected laboratory animals tested. This varied, however, with the virulence of the strain of the organism and the degree of spleen response as shown by development." W. Y.

JONES (E. R.). **The Use of Nitric Acid in the Serological Diagnosis of Cattle Trypanosomiasis.**—*Vet. Record*. 1936. May 9. Vol. 16. No. 19. pp. 602-605.

A large number of tests were carried out with 20 different chemical agents, all based on the theory of precipitation of serum cuglobulin excess in trypanosomiasis, either by distilled water or by solutions of various chemicals. The preliminary investigation showed that all the substances tested, except nitric acid, were non-specific. Thereafter only two tests were employed, *viz.* D.O.P.A. (dioxypheylalanine) and nitric acid, and finally nitric acid alone. In the earlier tests 1 drop of clear serum was added to 1 cc. of the reagent, but later work showed that the optimum ratio of serum to reagent was 1 to 25. Details of the observations are given in tables. The general conclusion is that the nitric acid test is specific for trypanosomiasis, but is only obtained in 45 to 50 per cent. of cases. The reaction is seldom given in the early stages of the infection when trypanosomes are present in the blood, and chiefly occurs in chronic or "latent" infections. W. Y.

DE GIORGI (Mario). La reazione di Foulton o "metodo al cloruro mercurico" nei ratti infestati da tripanosoma. [**Foulton's Mercuric Chloride Test for Trypanosome Infection.**—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. July. Vol. 17. No. 7. pp. 396-407.

The author carried out the test with dilutions of the mercuric chloride ranging from 1 : 1,000 to 1 : 80,000, using the serum of animals (rats) infected with *T. evansi*, *T. brucei*, *T. pecaudi*, and a species from the camel. One drop of the serum was brought into contact with 0.5 cc. of the reagent, vigorously shaken for some minutes and left at room temperature. Controls were put up with serum and physiological saline. Results were noted after 45 minutes and after 24 hours. The

findings are given in detailed protocols, but need not be recorded, for the author concludes that "the reaction is of no practical use in the diagnosis of trypanosome infection of white rats." *H. H. S.*

GOLD COAST: REPORT ON THE DEPARTMENT OF ANIMAL HEALTH FOR THE YEAR 1935-36 [STEWART (J. L.), Director of Veterinary Services]. [**Trypanosomiasis** pp. 13-17.]

In last year's report details are given of 65 cattle infected with trypanosomes treated with Surfen C [this *Bulletin*, 1936, Vol. 33, p. 663]. Most of these cattle have now been disposed of, and only 7 are still at Pong-Tamale; none of these have relapsed. Of those which have been disposed of, 9 have either relapsed or acquired a new infection. Experiments have shown that Surfen C is more effective when given intravenously than when administered intramuscularly, but, unfortunately, when given by the former method alarming symptoms are sometimes produced.

Several outbreaks amongst native cattle were treated by means of routine tartar emetic or antimosan inoculations.

The bulk of this paper is occupied with descriptions of various measures devised with the object of eradicating tsetse-fly at Pong-Tamale and the surrounding areas. *W. Y.*

ROBINSON (Saul S.). Dermatitis due to Tryparsamide. Report of a Case.—*Arch. Dermat. & Syph.* 1936. Aug. Vol. 34. No. 2. pp. 251-252.

Between May 31 and December 12, 1935, the patient, a woman aged 34, received 18 injections of tryparsamide, the last 13 of which each consisted of 2 gm. On December 13, the patient complained of a red itching eruption appearing about 8 hours after each of the 3 previous injections. A description of the eruption is given. The author points out that although dermatitis due to tryparsamide is considered mild, exfoliative dermatitis due to its use has been recorded by various authors. The increased intensity of the dermatitis in the present case, after each administration of the drug, necessitated its cessation in order to prevent a possible exfoliative dermatitis. *W. Y.*

FOURCHE (J. A.) & MORLIGHEM (H.). Traitement de la trypanosomiase par le tryponarsyl et le 309 Fourneau en mélange. [**Treatment of Trypanosomiasis by a Mixture of Tryponarsyl and 309 Fourneau.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. Sept. 30. Vol. 16. No. 3. pp. 317-332.

The authors record the result of treating 42 cases of trypanosomiasis, mainly in a very advanced stage, by the method recommended recently by DE MARQUEISSAC, *i.e.*, by the simultaneous administration of moranyl and tryparsamide. They prepared a 10 per cent. solution of moranyl and a 20 per cent. solution of tryponarsyl. Both solutions were taken up in the same syringe and injected in mixture. The dose of moranyl used was 2 cc. (20 cgm.) and that of tryponarsyl 5 to 8 cc. (1 gm. to 1.6 gm.); in young children the doses were reduced. It was their intention to give 11 or 12 injections at 4-day intervals, but the supply of moranyl was insufficient, and the treatment had to be concluded by tryponarsyl alone or in combination with Dn. 18. The patients were

re-examined a year after the commencement of the course of treatment.

Details are given of 42 cases, of which no less than 40 were re-examined. In all cases gland puncture remained negative when it was negative to begin with, and became negative when it was positive at the beginning. Almost all the cases had at first pronounced changes in the spinal fluid. Of the 37 in whom the spinal fluid was re-examined, 36 showed a marked fall in lymphocytes, and in 31 of these the number of leucocytes was between 1 and 10.

The general condition had improved greatly in all cases; the weight has increased and the oedemas have disappeared. It is remarked that the clinical improvement was apparent after 4 or 5 injections. The nervous troubles have disappeared in all but 2 cases; and there were no accidents, except in one very old man who developed transient visual disturbance.

W. Y.

ZSCHUCKE (Johannes). Untersuchungen ueber eine Heilwirkung des "B 205" auf die Schlafkrankheit des Menschen bei peroraler Verabreichung. [Investigation on the Curative Action of "Bayer 205" on Human Sleeping Sickness after Oral Administration.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 449-455. With 6 figs. [10 refs.]

The author has tested the value of Bayer 205 given by the mouth on a number of cases of human trypanosomiasis in Fernando Po and the adjoining mainland. The doses given were: 1st day 3 gm., 2nd day 4 gm., 3rd day 5 gm., and 5th and 6th days 6 gm. The blood of 3 of the 6 patients became free of parasites 48 hours after the first dose, and 5 of the patients relapsed. The swelling of the lymphatic glands was not influenced, but the tremors, muscular pains and general symptoms quickly disappeared. The general conclusion reached is that this method of administering Bayer 205 results in only exceptional cures, but produces a temporary improvement. This is due to the fact that different individuals absorb the drug in different degrees.

W. Y.

- i. SUDAN: ANNUAL REPORT OF THE VETERINARY SERVICE, 1935 [WILLIAMS (H. B.), Director]. Appendix I. pp. 30-32.—**I. Camel Trypanosomiasis. II. Equine Trypanosomiasis caused by *Tryp. congolense*** [BENNETT (S. C. J.), Vet. Res. Officer].
- ii. BENNETT (S. C. J.). **The Treatment of Equine *Trypanosoma congolense* Infections with Surfen C (Bayer).**—*Jl. Comp. Path. & Therap.* 1936. June. Vol. 49. Pt. 2. pp. 151-159.

i. A single intravenous dose of 4 gm. of Naganol effects a primary cure in the vast majority of camels. A period of "immunity" which, the author states, is "actually protection by residual Naganol" follows treatment, and this period is proportional to the dose of Naganol given. [The immunity is probably in part at least due to the immune body formation which occurs when a trypanosomal infection is cured by any drug.] The refractory period varies considerably in individual camels, some animals have been shown to be immune for nearly 4 months, whilst others were susceptible in less than 2 months. The relapse rate after 4 gm. of Naganol is exceedingly small.

ii. An account is given of the trial of Surfen C (Bayer) in the treatment of 14 horses infected with *T. congolense*. The author summarizes his observations as follows :—

" (1) It is almost certainly unsafe to administer Surfen C to horses intravenously.

" (2) While 'safe' in the usual chemotherapeutic sense to inject it subcutaneously, large swellings developing at the site of injection render this route objectionable.

" (3) Intramuscular injection is less objectionable than subcutaneous, although even by this route, in spite of giving multiple small doses, or even of giving a series of doses at intervals of a week or ten days, trouble-some local swellings may develop.

" (4) In no case in the recorded series of treatment did any toxic symptoms develop following intramuscular injection, indicating that horses can, apart from possible surgical complications, probably tolerate appreciably larger doses than were used in this series of observations.

" (5) Surfen C is certainly capable of curing nearly all, if not all, cases of *T. congolense* in horses, and in this respect it is the best agent hitherto studied. Its only drawback—and it is a serious one when the necessity for routine mass treatment has to be contemplated—seems to be referable not so much to the drug as to the patient, namely, the extreme variability of individual response. Some horses are cured by a single dose of 1 gm./100 kg. while others require much more. It is therefore unlikely that any orthodox course of treatment will be developed ; each patient will call for close individual attention, even to the degree of confirming cure by small-animal sub-inoculation."

W. Y.

EVANS (J. T. R.). *Trypanosoma congolense* Infection in Cattle: Treatment by Antimosan and Surfen "C."—*Jl. Comp. Path. & Therap.* 1936. June. Vol. 49. Pt. 2. pp. 160–162.

In 1934, twenty-seven bulls infected with *T. congolense* were treated with antimosan ; 20 received 5 injections at weekly intervals and the remainder 3 injections. The dose was 10 cc. per 100 lb. of body weight. The following year 12 infected bulls were treated by a course of 5 weekly injections. The general conclusion reached is that a full course of the drug " offers great hope of a complete cure being effected." Experiments with " Surfen C " indicated that the results obtained with a single dose were equal to those obtained from a full course of antimosan. This is, of course, a matter of great importance in field work.

W. Y.

ROSKIN (Gr.) & SCHISCHLIAJEWA (S.). Salvarsantherapie und Ultraviolettstrahlen. [*Salvarsan Therapy and Ultraviolet Radiation.*]—*Zent. f. Bakt. I. Abt. Orig.* 1936. June 12. Vol. 136. No. 7/8. pp. 425–429. [13 refs.]

In 1929, Roskin and ROMANOWA showed that the therapeutic action of salvarsan was considerably increased by the subsequent radiation of the treated animal [this *Bulletin*, 1930, Vol. 27, p. 233 and p. 837]. In order to obtain this result it is essential that the drug be given before the radiation ; but the result is also obtained if the treated animal is injected with the serum of a healthy irradiated mouse. Radiation alone has no effect on the infection. Study of the serum of irradiated animals revealed the presence of Factor A. The mechanism of production of this Factor is bound up with the integrity of the reticulo-endothelial system, and it is not formed in blockaded animals.

Later work showed that irradiation similarly enhanced the action of old salvarsan on *Sp. duttoni* infection of the mouse, and that of neosalvarsan on *Sp. pallida* infections. In the present work it was decided to ascertain whether ultraviolet radiation increased the action of other drugs. Experiments with germanin and tartar emetic gave negative results. The view that the results obtained with novarsolan would apply to all arsenical preparations proved to be wrong, because negative results were obtained with all the pentavalent and trivalent compounds of arsenic examined.

The authors next pass to a consideration of the fact that GIEMSA and ELLENBERGER (1930) and GIEMSA and JEROVEC (1931) had been unable to confirm their results. The only difference between their experiments and those of the German investigators was that whilst they had used the Russian preparation novarsolan, the Germans had used German neosalvarsan. Repeating their experiments, Roskin and his colleagues obtained 100 per cent. of positive results with novarsolan, but with neosalvarsan the results were negative. Further work with 8 preparations of neosalvarsan and 4 of old salvarsan showed that only novarsolan gave positive results.

Roskin next inquires whether the mechanism of the action of ultraviolet radiation in increasing the therapeutic effect of German old salvarsan on *Sp. duttoni* infections is similar to that of novarsolan on *T. equiperdum*. With that object in view he performed a long series of experiments on the treatment of *Sp. duttoni* infections in mice with old salvarsan. All the mice received the same (non-curative) dose of old salvarsan. Half of them were injected subcutaneously with 0.3–0.4 cc. of the serum of irradiated healthy mice. Of the 54 given the combined treatment 75 per cent. were cured, but of the 56 which were given the drug alone only 5.8 per cent. were cured. The authors conclude from this that the mechanism of action of old salvarsan on *Sp. duttoni* infection is the same as that of the Russian novarsolan on *T. equiperdum*.

W. Y.

RUSSELL (Helen). **Observations on Immunity in Relapsing Fever and Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 179–190. With 6 charts. [15 refs.]

This paper is concerned with some aspects of immunity in relapsing fever and trypanosomiasis.

From the serological point of view the interest in the two infections is that in both there is evidence that the infecting parasite is able to readapt itself—or to vary serologically—several times in the body of a host without any loss of pathogenicity in the variants. A short summary of the work which has been done on the serology of relapsing fever and trypanosomiasis is given.

JANCSÓ (1918) observed that the spirochaetes of an attack of relapsing fever differed serologically from those of the relapses; and CUNNINGHAM (1925) showed that at each relapse in any one animal the spirochaete is of a new serological type: he also demonstrated the alternation of types which occurs when the infection is passed on at a relapse into a new animal. The author (1931) in the Gold Coast confirmed Cunningham's results. It was concluded that *T. recurrentis* had the capacity of producing several serological variants in one host, each variant being equally pathogenic. The limited number of variants which is detected in any epidemic was explained by the

alternation of variants which occurs when the parasite reaches a new host which is not already immune to any variant ; this alternation tends to keep certain variants dominant.

In a chart details are given of the ordinary course of relapsing fever in a series of *Cricetomys gambianus*, in which rat the disease is very similar to human infection. It shows the emergence of a new serological variant at each relapse and the appearance of a specific lesion for each variant in turn. If the blood is passed to a new animal in the interval between the attacks, and an infection occurs in the new animal, the type of spirochaete is serologically identical with that which appears in the next relapse of the donor. Another chart shows the average titre of the lysin for the attack and first relapse spirochaetes in a series of *C. gambianus* ; and still another chart demonstrates the alternation of variants which occurs when relapses are passed on to new animals.

The special interest in relapsing fever is in the ability of the spirochaete to readapt itself antigenically several times in one host without loss of pathogenicity. The possible variants in one host are limited because the infection does die out. This may be explained either by the host producing an antibody antagonistic to all variants (but there is, as yet, no evidence of this), or it is possible that a strain of spirochaetes cannot readapt itself more than a few times in one host.

The author's immunological studies on trypanosomal infections were made at Liverpool in 1934. Rabbits were infected with *T. rhodesiense* and at weekly intervals mice were injected with blood from the rabbits ; at the same time each week serum was stored in the ice-chest in order that it could be tested for lysins as soon as the mouse infections were positive. It was found that the rabbit serum removed each week contained lysins of low titre for the variant trypanosome, which had been isolated the week before, but had no lytic effect on the variant which was present when it was withdrawn. The technique used to detect lysins was that described by the reviewer and his colleagues in their work on chemotherapy. The results of these experiments are given in tables. Russell concludes that the course of an infection with a pathogenic trypanosome depends on the capacity of the parasite to vary serologically so often in the body of the host that it defeats the possible variations of the host's defence.

W. Y.

BEVAN (LI. E. W.). **Notes on Immunity in Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 199–206. [10 refs.]

In 1928, the author introduced a method of inoculation against trypanosomes whereby cattle were deliberately infected with known strains of typanosomes, and were then treated with a view to setting up a state of tolerance. It was found that the treated animals could return to the fly area and remain healthy in spite of re-infection. Breakdown of tolerance occurred, however, from various causes. The cattle became infected with trypanosomes against which they had not been rendered tolerant ; and such factors as starvation, overwork, mineral and vitamin deficiencies and intercurrent infections also cause breakdown of resistance.

It therefore became obvious that an alternative process, based upon a firm "sterile immunity" rather than an immunity tolerance, was desirable, and it was decided to endeavour to devise such a method.

References from the literature are quoted to show the relative resistance of young animals to the ravages of trypanosomiasis. The author describes a number of experiments with rats and mice and a virulent strain of *T. rhodesiense*. The following summary is given :—

" 1. The treatment of cattle suffering from trypanosomiasis with intravenous injections of potassium antimonyl tartrate was introduced into Southern Rhodesia in 1909 and has since been adopted with considerable success.

" 2. In the course of 25 years' experience, it has frequently been observed that treated recovered animals may return to the tsetse-infested areas and remain there apparently in good health in spite of re-infection. This observation has been confirmed by veterinarians in other parts of Africa.

" 3. Treated animals either are sterilised of the parasite and again become susceptible to re-infection, or are not completely sterilised and become tolerant.

" 4. A method of inoculation and treatment based upon these observations was introduced in 1928. It consisted of the deliberate infection of cattle with known strains of trypanosomes—preferably the strains of the district in which the animals were to be exposed—and of treating them at the appropriate time.

" 5. In this manner they were rendered tolerant or immune, but in practice it was found that their tolerance broke down when the animals were subjected to adverse conditions. To obviate breakdown would involve a revolution of present-day conditions of animal husbandry in tsetse-infested areas.

" 6. Tolerant animals become reservoirs of infection ; therefore a complete sterile immunity, rather than a tolerance, would be preferable.

" 7. In nature the resistance of the wild animals in tsetse-infested areas is, in most cases, a tolerance. A similar condition is sometimes met with in indigenous domestic animals.

" 8. Old hunters and explorers have attributed this resistance to the infection of young animals during their early days.

" 9. Recent experiments with rats and mice indicate that young animals are susceptible to infection ; but if well nourished and not unduly disturbed, they may survive an infection sufficiently virulent to kill weaklings or adults. If they recover, they again become susceptible ; but if re-infected during the course of the original infection, they become tolerant.

" 10. These observations indicate how tolerance may be acquired in nature and suggest that it is maintained by repeated re-infection.

" 11. They explain the peculiar incidence of latent cases of sleeping sickness in Southern Rhodesia and suggest preventive measures.

" 12. They also indicate that the tolerance of inoculated cattle should be maintained by repeated syringe or fly infection.

" 13. The integral properties of the young which render it partly resistant have not been determined, but appear to be worthy of further research.

" 14. A method of setting up a complete and lasting sterile immunity in man and animals against trypanosomiasis comparable to that commonly set up against bacterial and virus diseases appears to offer a solution to the tsetse fly problem."

W. Y.

BROWNING (C. H.) & GULBRANSEN (R.). **Immunity following Cure of Experimental *Trypanosoma brucei* Infection by a Chemotherapeutic Agent.**—*Jl. Path. & Bact.* 1936. Nov. Vol. 43. No. 3. pp. 479-486. [19 refs.]

In this work the authors have studied the immunity which an experimental animal infected with trypanosomes exhibits after cure by a

single dose of a drug. They show that it depends on (a) the particular strain of parasite, and (b) the species of the host, irrespective of the clinical type which the disease assumes in the latter.

In the case of mice infected with highly virulent strains of *T. brucei*, it has usually been found that when cure is effected by a single dose of a drug like arsacetin immunity reaches its height within 10 days. Under these conditions the immunity was usually manifested by a few days protraction of the incubation period. In the present work this was confirmed for 3 strains of *T. brucei*, viz., Paris II and III and Wormall. In the case of the Prowazek strain immunity to reinoculation with the homologous organism is so pronounced that frequently infection fails to develop, a considerable proportion of cured animals reinoculated after an interval of 23 days failing to become infected.

HARTMANN (1930) found that in rabbits cured of infection with the Prowazek strain complete immunity might persist for 22 to 33 weeks. In the authors' experiments with rabbits the three strains of *T. brucei* mentioned above were used. Of 9 rabbits inoculated with these strains—none of which produces a high degree of immunity in mice—and cured by a single dose of a rapidly excreted drug (styryl 314) all except one resisted reinoculation from 6 to 32 months later. Three of them resisted 3 reinoculations from 12 months onwards.

The serum of these immune rabbits exerted some protective action, which was shown when it was added to living trypanosomes of the homologous strain and the mixture injected into mice. W. Y.

LOURIE (E. M.) & O'CONNOR (R. J.). **Trypanolysis *in vitro* by Mouse Immune Serum.**—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 365–388. [24 refs.]

The authors have studied by *in vitro* technique the trypanolytic substance which develops in the blood of infected mice after treatment with halarsol. They have had no difficulty in obtaining lysis of the homologous strain, by the serum of mice immune (or relatively immune) to various trypanosomes, viz., *T. rhodesiense*, *T. equinum*, *T. equiperdum* and two strains of *T. brucei*, all of which had been preserved in mice for considerable periods. Whilst lysis was rapid in presence of complement, it also occurred, but more slowly, in its absence. The authors spent some time examining the rôle of complement in the phenomenon, and also in investigating the influence of various factors upon the trypanolytic titre of the immune serum. They summarize their results as follows:—

" 1. It is well known that, following suitable drug treatment of mice infected with one of the rapidly fatal strains of trypanosome, there is an immunity, or relative immunity, to reinfection with the same strain. Since the work of Ehrlich and Shiga (1904) it has been repeatedly reaffirmed by a considerable number of workers, to some of whom we have referred in the text, that this immunity is of a very transient nature, generally being lost in the course of a few weeks. However, in our experience, immunity to reinfection is generally retained for at least as long as 8 months after treatment.

" 2. Although trypanolysis *in vitro* by immune serum of larger animals has been established for more than 30 years, very scant attention has hitherto been paid to the demonstration of this phenomenon by mouse immune serum. Several writers declare that trypanolysis *in vitro* by mouse immune serum does not occur at all, or does so only occasionally and in very slight degree—and this failure has been ascribed to the lack of complement in mouse serum. We have found that trypanolysis by mouse

immune serum may readily be demonstrated *in vitro* at 37°C., not only in the presence of added haemolytic complement, but also in the entire absence of that factor. In the former case the trypanocidal action is complete within half an hour, and the titre is relatively high; in the latter case the action is much more protracted, and the titre is lower. In some instances, however, in the presence of added complement, trypanolysis is unduly delayed in higher concentrations of mouse immune serum, while being rapidly effective in lower concentrations. We give experimental support for the belief that this anomaly is due to an anti-complementary action of mouse serum.

"3. Trypanosomes have been sensitized, through contact with mouse immune serum at 0°C. for 1 hour. By washing and then distributing these parasites among tubes containing dilutions of haemolytic complement (fresh guinea-pig serum), it has been found that, under the conditions of our experiment, a concentration of 1:16-1:32 of complement is sufficient for trypanolysis to take place within half an hour at 37°C. In the absence of complement, however, trypanosomes sensitized in the above manner do not undergo lysis during a period of 24 hours.

"4. Figures are given showing the influence upon the trypanolytic titre of mouse immune serum (in the presence of complement) of the following factors:—(a) time since treatment, (b) degree of infection, and (c) size of dose. The general trend is for the titre to rise steeply during the first few days, reaching a high level, which may be as much as 1,024, or even 2,048, between about the fourth and eleventh days. There follows a gradual decline during the next 3 or 4 weeks, till a low range of between 2 and 32 is reached, and this is maintained, with a few defections to below 2, for at least as long after treatment as 8 months. The curve is apparently not markedly influenced either by the degree of infection at the time of treatment, or by the dose of drug given, although there is indeed a slight delay in the appearance of trypanolysins in the case of lightly infected mice treated either by a small or a large dose.

"5. Trypanolysis *in vitro* of the homologous parasites has been observed by sera from mice immune respectively to each of five strains (comprising four separate species) of pathogenic trypanosome. While we have made no cross-tests between any of these sera and the five corresponding strains, a high degree of specificity has been shown between mouse immune serum for our *T. rhodesiense*, on the one hand, and immune serum for a relapse off-shoot of the same strain, on the other. The trypanolytic titres attained, at various times after treatment, by immune sera for each of the strains (including the relapse off-shoot just mentioned) upon which fewer observations have been made, all fit perfectly into the curve of titre for immune serum in respect of the strain of *T. rhodesiense* upon which the greater part of the present work has been done.

"6. The trypanolytic titre of mouse immune serum, as tested in the presence of complement, is unaffected by heating to 60°C. for half an hour, but is materially reduced by a temperature of 64°C. for half an hour. The serum may be stored at 0°C. for at least 6 weeks, without any loss in its potency."

W. Y.

SCHILLING (Claus). **Immunization against Trypanosomiasis, 3rd Contribution.**—*Jl. Trop. Med. & Hyg.* 1936. Oct. 1. Vol. 39. No. 19. pp. 221-222.

—. Immunisierung gegen Trypanosomenkrankheiten.—*Deut. Med. Woch.* 1936. Oct. 16. Vol. 62. No. 42. pp. 1715-1716.

—. Immunisation contre les maladies à trypanosomes.—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 886-888.

These papers give an English, German and French version of the same theory. They deal with matter which has already been published elsewhere and noticed in this *Bulletin*.

W. Y.

SCHILLING (Claus) with H. SCHRECK, H. NEUMANN & H. KUNERT.
Versuche zur Schutzimpfung gegen Tsetsekrankheit. V. Teil.
[Experiments on Protective Inoculation against Tsetse-Fly Disease.]
—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Sept. 18.
Vol. 89. No. 1/2. pp. 112–114.

Later information is given regarding the fate of calves immunized by the minimal infection method [this *Bulletin*, 1935, Vol. 32, p. 714]. Of 12 calves preimmunized by 4 minimal injections of 10–50 trypanosomes and then sent into a tsetse area, 9 (66 per cent.) were alive 23 months later. Of 13 control animals 3 (23 per cent.) were alive.

Experiments are described showing that the resistance of mice and dogs to *T. congolense* can be raised by the same method of repeated minimal infection.
W. Y.

SCHILLING (Cl.); ROUBAUD (E.). Au sujet des modes divers de l'évolution trypanosomienne chez les glossines. [The Various Methods of Evolution of Trypanosomes in Glossina.]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 817–821.

This very interesting correspondence was provoked by the recent paper of Roubaud on this subject [this *Bulletin*, 1936, Vol. 33, p. 180].

Schilling writes that if the proboscis of a tsetse is examined some hours after a meal, it is found to contain a limpid fluid practically devoid of red cells. This is serum which remains in the labial cavity; in the intervals between meals this fluid becomes mixed with saliva from the hypopharynx and also by diffusion with the contents of the pharynx and even of the proventriculus. Schilling believes that it is the composition of this serum-saliva mixture which determines the fate of trypanosomes entering the proboscis. Those flagellates which cannot adapt themselves perish; the more quickly they adapt themselves the more quickly they multiply and change into metacyclic forms.

Trypanosomes of the *vivax* group adapt themselves most easily to the serum-saliva medium; they develop there, remain in the proboscis, enter the hypopharynx and complete their development. They do not invade the salivary glands, which contain pure saliva, nor do they invade the pharynx.

T. congolense and its allies adapt themselves easily to the serum-saliva medium. The infection may be limited to this medium, but very often they descend into the intestine, where they develop. Schilling entirely agrees with Roubaud that this is a "route fausse" which only leads to an impasse of no importance for the developmental cycle. He asks whether it is necessary to assume an evolution in the pharynx and proventriculus and a migration back towards the proboscis. He believes that it is possible that a minute quantity of saliva entering the proximal part of the intestine favours the evolution of the cyclic forms which then ascend towards the labial cavity.

T. brucei and its allies finish their development in the pure saliva of the glands and hypopharynx. But how do they get there? The theory that they traverse the body cavity from the gut can be dismissed as highly improbable. Schilling considers it more likely that scanty trypanosomes pass immediately into the hypopharynx and thence into the salivary glands, where they establish themselves and undergo their development. The flagellates of this group are polymorphic, and it is possible that among the forms one may be able to adapt itself to the

saliva more readily than the others; it rapidly ascends the hypopharynx in order to attain as quickly as possible to the place containing the greatest concentration of saliva, *viz.*, the glands themselves. The other trypanosomes of this group pass into the intestine and evolve there into intestinal flagellates—an evolution which is primitive and aberrant.

Roubaud finds himself in the main to be in agreement with these views. He also considers the intestinal infections observed in the groups *congolense* and *brucei-gambiense* to be, as a rule, without issue. He agrees that Schilling's speculations regarding the method by which the group *brucei-gambiense* reach the salivary glands is plausible, but points out that the proof is still lacking. W. Y.

MESNIL (F.), LEGER (M.) & PÉRARD (Ch.). Essais divers d'infection des poules par des trypanosomes pathogènes de mammifères. [**Attempts to infect Fowls with the Pathogenic Trypanosomes of Mammals.**—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 679–682.

After briefly reviewing the literature relating to this subject, the authors describe various experiments performed by themselves during recent years.

The first series of experiments was conducted in 1928–1929. Six animals were inoculated with 1 cc. of blood heavily infected with *T. gambiense*: 1 cock and 1 hen were inoculated into the caruncle, 2 cocks subcutaneously and 2 cocks intraperitoneally. None of the birds became infected. In a second experiment various fowls were inoculated with *T. gambiense* and some kept at low temperatures and others at high temperatures; the results were all negative. In a third experiment 2 cocks were inoculated with *T. rhodesiense* without result.

The second series of experiments was undertaken in 1931. In these the authors first tried other trypanosomes, *viz.*, *T. brucei* and a second strain of *T. gambiense*. In later experiments the effect of blocking the reticulo-endothelium by chinese ink and iron sugar was tested. In all these animals the results were again negative.

The third and fourth series of experiments, which were conducted in 1933–1934 and in 1935, respectively, were of a similar nature and gave equally negative results. The authors conclude by observing that it seems to be very difficult to ascertain under what condition fowls become infected. W. Y.

ZSCHUCKE (Joh.). Vergleichende Untersuchungen ueber experimentelle Trypanosomiasis nach Impfung ins Blut oder in den Liquor cerebrospinalis. [**Comparative Investigations on Experimental Trypanosomiasis after Inoculation into the Blood or Cerebrospinal Fluid.**—*Ztschr. f. Hyg. u. Infektionskr.* 1936. July 18. Vol. 118. No. 5. pp. 615–622.

With the object of examining the significance of invasion of the cerebrospinal fluid for the treatment of sleeping sickness, the author carefully compared experimental infections following inoculation of the blood and cerebrospinal fluid, respectively.

The animals used were cats, dogs and rabbits; and the course of the disease in these animals, following blood inoculation, was compared

with that following intrathecal inoculation. The following points were specially observed :—

1. The time of first appearance of trypanosomes in the blood.
2. The time of first rise of temperature.
3. The date of the first clinical signs—oedema, glandular swellings, etc.
4. The date of appearance of nervous signs—disturbance of gait, paresis of the hind-limb, tremors, convulsions, eye lesions, etc.
5. Changes in the cerebrospinal fluid—cell count and Lange's gold curve.

The infection of cats with *T. brucei* was chosen, as the most likely to give satisfactory results, because, according to PRIEUR (1930), it runs a rather short typical course terminating with nervous phenomena. Zschucke found, however, that with his strain of trypanosomes the course of the disease varied with the number of trypanosomes injected. With large injections the disease ran an acute course to a fatal end. In order to prolong the infection and to enable the nervous signs to be studied better, it was necessary either to infect with a small number of trypanosomes, or to control the infection with small doses of Bayer 205 from time to time.

In addition to studying the above infection, the author also used *T. congolense* in cats, which, as a rule, ran a chronic course ; *T. congolense* in dogs, which ran a subacute course often with pronounced nervous signs ; and *T. gambiense* in rabbits, which presented analogies with human sleeping sickness.

The results of the numerous experiments are summarized in tables, from which it is seen that the infections resulting from blood inoculation did not differ appreciably from those following intrathecal inoculation.

W. Y.

JANSSENS (Pierre G.). Contribution expérimentale à l'étude de l'influence du chauffage au bain-marie et des ondes courtes, seules ou en association chimiothérapique, sur une souche arsénorésistante de "*Tr. gambiense*." [**Experimental Study of the Influence of Heat caused by the Water Bath or Short Radiation, Alone or in Conjunction with Chemotherapy, on an Arsenic-Resistant Strain of *T. gambiense*.**—*Rev. Belge Sci. Méd.* 1936. June-July. Vol. 8. No. 6. pp. 400-440. With 43 diagrams. [31 refs.]

The object of the experiments described in this paper was to ascertain whether it was possible to break down arsenic-resistance by means of heat. The strain of trypanosomes used was an arsenic-resistant *T. gambiense* supplied by VAN HOOFF from a patient in the Belgian Congo, whose infection had resisted a course of treatment by trypanarsyl. It was passed through a *Cercopithecus* into guineapigs. The degree of arsenic-resistance was such that, whilst a dose of 50 cgm. per kilo. of trypanarsyl caused the trypanosomes to disappear for about 10 days, relapses always occurred : similar doses given to guineapigs infected with the normal strain produced a definite cure.

A long series of observations were performed to ascertain the thermal death point of the trypanosomes in suspension *in vitro*. In other experiments it was unsuccessfully attempted to influence the course of the infections in guineapigs by raising the temperature of the animals

by radiation with short rays, and in still others the combined action of radiation and treatment by trypanarsyl was shown to be without effect on infections caused by the resistant strain. W. Y.

LAUNOY (L.), PRIEUR (M.) & ANCELOT (A.). Suite à l'étude d'une souche de *Trypanosoma annamense* rendue résistante à la tryparsamide. [**Further Studies of a Strain of *T. annamense* made Resistant to Tryparsamide.**].—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 759-769.

In a previous paper [this *Bulletin*, 1936, Vol. 33, p. 203] the authors describe the method of preparation of their resistant strain, and experiments showing that it was resistant to other pentavalent and trivalent aromatic arsenicals. This general fact had been previously made known by the reviewer and his colleagues, who showed that an atoxyl-resistant strain of *T. rhodesiense* was also resistant to the usually employed aromatic arsenical and antimonial compounds and to acriflavine, but not to tartar emetic or to "Bayer 205."

Re-examination of the resistance of the authors' strain showed that it was still intact at the 77th mouse passage 10 months after it had been made resistant.

The resistance of the strain was tested against 2 complex organic arsenicals—one prepared by May & Baker, No. 529, and the other in Fourneau's laboratory, No. F. 682. There was definite evidence of resistance against the former, but the results with the latter were unsatisfactory, owing to the relatively feeble action of the compound on the normal strain. It was also found that the tryparsamide-resistant strain exhibited a certain degree of resistance to antimony-III-thiomalate of lithium.

The fact that the reviewer and his colleagues had found that an atoxyl-resistant strain was in all respects identical with an acriflavine-resistant strain suggested to the authors that they should test the resistance of their strain to gonacrine. This substance is a mixture of 60 per cent. HCl of the chloride of 3-6-diamino-10 methylacridine and of 40 per cent. of the chlorhydrate of 3-6 diaminoacridine. The experiments showed that the tryparsamide-resistant strain also exhibited resistance to gonacrine.

Experiments with moranyl showed that the tryparsamide-resistant *T. annamense* required up to double the dose necessary to cure the normal strain.

The authors conclude by stating that their conclusions are in complete accord with those of the reviewer and his colleagues, except that they have found that their tryparsamide-resistant strain exhibits a certain degree of resistance to Bayer 205. W. Y.

DUBOIS (A.). La résistance des trypanosomes aux arsenicaux aromatiques s'étend à d'autres produits aromatiques non-arsenicaux. [**Resistance of Trypanosomes to Aromatic Arsenicals extends to Other Aromatic Products which do not contain Arsenic.**].—*Ann. Soc. Belge de Méd. Trop.* 1936. June 30. Vol. 16. No. 2. pp. 173-176.

The reviewer and his colleagues have shown that a strain of *T. rhodesiense* made resistant to atoxyl or acriflavine is resistant to other aromatic compounds of arsenic or antimony, but not to inorganic

compounds of arsenic, or to tartar emetic or Bayer 205. The author has confirmed these observations in experiments conducted on another species of trypanosome, *viz.*, a Madimba strain (*T. brucei-pecaudi*).

W. Y.

DUBOIS (A.). Essai d'obtention d'une souche atoxyl-résistante au moyen d'un produit aromatique non arsenical et non trypanocide. [**Attempt to produce an Atoxyl-Resistant Strain by Means of a Non-Arsenical and Non-Trypanocidal Aromatic Substance.**].—*Ann. Soc. Belge de Méd. Trop.* 1936. June 30. Vol. 16. No. 2. pp. 165–172. [10 refs.]

Arising out of the work of the reviewer and his colleagues, which led them to conclude that in so-called arsenic or antimony resistance the resistance was really to the aromatic base and not to the metallic elements, the author attempted to produce a resistant strain by the use of paraminobenzoic acid. This substance contains no arsenic and is non-trypanocidal. Attempts to produce a resistant strain by *in vivo* and *in vitro* methods failed.

W. Y.

NAITO (T.) & OKA (S.). Untersuchungen ueber die Festigkeit von Trypanosomen gegen Arsenpräparate. [**Observations on the Resistance of Trypanosomes against Arsenicals.**].—*Zent. f. Bakt.* I. Abt. Orig. 1936. Nov. 9. Vol. 137. No. 8. pp. 401–418. [55 refs.]

After giving a rather lengthy review of the literature of the subject, the authors describe the preparation of strains of nagana (Prowazek) resistant to neosilversalvarsan, neosalvarsan and orsanine, respectively. The resistant strains were made in the usual way by repeated administration of subcurative doses of the drugs to infected mice. As is shown in tables a maximum resistance to orsanine was obtained after 13 passages, but maximum resistance to neosalvarsan and to neosilversalvarsan was not reached until the mouse of the 50th passage.

The reactions of these three resistant strains to a large number of arsenical and antimonial preparations were then examined. They all behaved similarly in that they were sensitive to arsenophenylglycine and solusalvarsan, and to germanin, tartar emetic and fuadin; but they all resisted tryparsamide, myosalvarsan, the arsenopyridin compounds B R 1 and B R 23, and trypaflavine.

W. Y.

VON JANCSÓ (N.) & VON JANCSÓ (H.). Beziehungen zwischen chemotherapeutischer Wirkung, Oxydationskatalyse und Redoxpotential. [**Relations between Chemotherapeutic Action, Oxydationkatalysis and Redoxpotential.**].—*Ztschr. f. Immunitätsf u. Experim. Therap.* 1936. June 26. Vol. 88. No. 3/4. pp. 275–323. [65 refs.]

The combination of chemotherapeutic substances with various chemicals in curative experiments on trypanosome infected animals frequently gives rise to interference; this phenomenon, which is highly interesting from the chemotherapeutic and biochemical standpoint, affords a deep insight into the mechanism of chemotherapeutic action.

A new theory is advanced to explain the interference phenomenon. This states that the combinations which produce interference are those which form thermodynamic reversible redox systems, the redox potential of which belongs to a definite potential range.

In support of this theory the authors succeeded in discovering about 17 new instances of interference by substances which were chemically quite distinct, which were all reversibly reducible, and which, to a greater or less extent, inhibited the trypanocidal action of the trivalent arsenicals and antimonials.

The interference action is accordingly a characteristic attribute of electro-active bodies, which readily store up and give off electrons.

As is shown by the systematic examination of 22 chinoid redox dyes with graduated normal potentials, the activity varies gradually with the value of the normal potential.

The weakly positive and negative dyes between the potential points of the redox scale $+0.115$ and -0.060 vol (pH 7), *viz.*, toluylenblue, thionin, cresylblue, gallocyanin, toluidin blue, azur I, methylene blue, pyocyanin, janus green and aethylcapri blue, all exhibit a pronounced interference action.

A distinct optimum is reached at $+0.011$ volt; toluidin blue, and especially azur I, inhibit the action of even large doses of arsenoxide and fuadin.

The 8 dyes, the normal potential of which is below -0.060 , were inactive.

Vitamin C exerts a strong interference action against fuadin, and this is to be explained by the fact that ascorbic acid forms a reversible redox system. Reasons are given for believing that the redox bodies act by influencing the sensitiveness of the trypanosome.

The interference of such dyes as toluidin blue, cresylblue, janus green and azur I on the trypanocidal action of arsenoxide was also confirmed by *in vitro* experiments; the action of a 1 : 30,000 solution of arsenoxide, which normally killed trypanosomes in 1 or 2 minutes, was so far inhibited by the dyes that the parasites were still actively motile after 15 to 20 minutes.

The explanation given by the authors of the inhibitory action of the dyes is that trivalent arsenicals and antimonials damage the respiratory system of the trypanosomes, but the dyes which interfere do so by acting as accessory respiratory catalysts. W. Y.

SCHEFF (G.) & HASSKÓ (A.). Einfluss einiger Chemotherapeutika auf den Stoffwechsel der Trypanosomen, mit Rücksicht auf das Interferenzphänomen. [**The Influence of Certain Chemotherapeutic Substances on the Metabolism of Trypanosomes with Reference to the Interference Phenomenon.**]*—Zent. f. Bakt. I. Abt. Orig.* 1936. June 12. Vol. 136. No. 7/8. pp. 420–424.

BROWNING and GULBRANSEN have shown that parafuchsin interferes with the subsequent action of trypaflavin, and VOEGTLIN that sodium thioglycollate interferes with the action of salvarsan. In the present paper the authors have examined the effect of each of these 4 substances on the oxygen and sugar consumption of trypanosomes, and also the effect of the first two and the second two in combination. The general plan of their experiments was as follows. In each group 4 rats were used; the first was given parafuchsin (or sodium thioglycollate) and exactly an hour later trypaflavin (or salvarsan), the second was given parafuchsin (or sodium thioglycollate) only, the third trypaflavin (or salvarsan) only, and the fourth served as a control. The rats were killed at intervals varying from 2 to 5 hours later, and the heart blood taken up into 3 per cent. citrate solution. The trypanosomes were

separated from the blood cells by fractional centrifugation and suspensions containing similar numbers of trypanosomes made in a medium consisting of equal parts of defibrinated sheep's blood and Locke's fluid containing 2 per cent. glucose. The oxygen consumption and the sugar consumption of these various suspensions (containing approximately equal numbers of trypanosomes) were then ascertained over periods totalling about 5 hours. The results of typical experiments are given in a couple of tables. It was found that the oxygen consumption of the trypanosomes treated with parafuchsin and tryptaflavin alone was somewhat decreased, whereas the sugar consumption was greatly decreased. The suspension from the rat, which was the subject of the interference experiment, consumed about as much oxygen and sugar as the control. Similar results were obtained with the sodium thioglycollate and salvarsan experiments.

W. Y.

- i. ZOLOG (M.) & COMSIA (O.). Nouvelles recherches sur l'action des substances arsénobenzoliques dans les trypanosomiasés expérimentales. [**New Researches on the Action of Arsenobenzols in Experimental Trypanosomiasis.**]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 24. pp. 1132–1134.
- ii. — & —. Rôle du système réticulo-endothélial dans le mécanisme chimiothérapique des corps arsénobenzoliques. [**Rôle of the Reticulo-Endothelial System in the Chemotherapeutic Mechanism of Arsenobenzols.**]—*Ibid.* pp. 1135–1137.
- iii. — & —. Système réticulo-endothélial et action thérapeutique des corps arsénobenzoliques. [**The Reticulo-Endothelial System and the Therapeutic Action of the Arsenobenzols.**]—*Ibid.* pp. 1138–1140.

i. This work was undertaken in order to ascertain whether neo-salvarsan acted directly on trypanosomes, or whether it was first converted into toxalbumen in the liver, or whether it was reduced. The experiment consisted in filling a collodion sac, which was permeable to albumen, with a suspension of *T. equiperdum*, and then implanting this in the peritoneal cavity of white rats, which also received an intraperitoneal injection of trypanosomes. The animals were then injected subcutaneously with the drug, and after various intervals killed, and the condition of the parasites in the peritoneal cavity and in the collodion sac examined. It was found that those free in the peritoneal cavity were destroyed before those in the sac. In a second series of experiments the drug was injected into the collodion sac containing the trypanosomes. In this case the parasites in the sac were destroyed before those free in the peritoneal cavity. In a third series the drug was placed in a separate collodion sac. The conclusions are that toxalbumen is not the therapeutic substance and that reduction is not essential.

ii. Experiments were undertaken to ascertain the effect of blockade of the reticulo-endothelial system on the therapeutic action of neo-salvarsan in mice infected with *T. equiperdum*. It was found that contrary to the experience of previous workers, blockade by heavy doses of Chinese ink or electro-colloidal copper enhanced the therapeutic action of the drug; the authors explain this phenomenon on the hypothesis that the blocked animals had a higher concentration of drug in the blood.

iii. The experiments here described were performed in order to discover whether an intense blockade or destruction of the reticulo-endothelial system coinciding with the infection of the animals had any effect on the ultimate chemotherapeutic process. It was found that Chinese ink or electro-colloidal copper administered shortly before infection with *T. equiperdum* had no effect on the evolution of the disease. Blockade by Chinese ink previous to infection, and preceding the administration of the drug by 3 days, exerted a favourable influence on the treatment. Electro-colloidal copper given before infection and followed 3 days later by the drug produced a slight reduction in the parasitic effect of the medicament; this is in contrast to what happens when the injection of the copper shortly precedes treatment. W. Y.

SCHERN (Kurt) & ARTAGAVEYTIA-ALLENDE (Ricardo). Zur glykoprivierten Therapie und Prophylaxe mit sowohl toxisch als auch atoxisch wirkenden Substanzen bei der experimentellen Trypanosomen- und Treponemen-Infektion. [**On Hypoglycaemia Therapy and Prophylaxis with Toxic and Atoxic Acting Substances in Experimental Trypanosomal and Spirochaetal Infections.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Sept. 18. Vol. 89. No. 1/2. pp. 21-64. [32 refs.]

The authors refer in considerable detail to previous work on the disturbance of carbohydrate metabolism which occurs in trypanosomal infections. Consideration of this work caused them to inquire whether it might not be possible to influence trypanosomal infections by the administration of substances which caused a hypoglycaemia. It was found, however, that such substances as phosphorus, phloridzin, insulin and urethane, failed to cure *Trypanosoma equinum* infections; starvation was likewise without influence. Synthalin, however, had a curative action not only on *Trypanosoma equinum* infections, but also on infections due to *Treponema hispanicum*.

The authors conclude that the curative action of synthalin is not due to the fact that it produces a hypoglycaemia, but is in part due to a toxic action on the parasites. It was found that synthalin has no action on *T. cruzi* infections. [This paper should be read in conjunction with that of VON JANCSÓ, who likewise found that synthalin exercises a curative action on trypanosomal infections; *vide* this *Bulletin*, 1936, Vol. 33, p. 204.] W. Y.

KLIGLER (I. J.) & OLITZKI (L.). **The Antigenic Composition of *Trypanosoma evansi*.**—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 287-291.

This paper presents the results of a preliminary series of antigenic analyses made with *Trypanosoma evansi*. The blood of highly infected rats was taken into glucose citrate solution and the washed trypanosomes obtained in the usual method by fractional centrifugation; the packed sediment was dried *in vacuo* over CaCl_2 . The material from 10 rats weighed about 50 mgm., an amount found to be sufficient for the various tests and analyses.

The analysis was made as follows:—The dried material was suspended in alcohol (25 cc. of 96 per cent. alcohol to 50 mgm. of trypanosome substances), and extracted for 2 days at 30°C. The suspended material was then removed by the centrifuge and suspended in 15 cc.

of ether and extracted for 48 hours at 20°C. The ether was removed and the residue dried and weighed. It was then taken up in N/2NaOH, heated to 37°C., and filtered. The solution was treated twice with 2 volumes of absolute alcohol, and the second precipitate, which represented the C or carbohydrate substance, was centrifuged, dried and weighed. In another lot the residue obtained, after the alcohol and ether extraction, was analysed for N.

In this manner 4 fractions were obtained: (1) alcohol soluble, (2) ether soluble, (3) protein residue, and (4) C or carbohydrate fraction. The results of the analyses are shown in tables and are compared with similar analyses of Shiga's dysentery bacillus.

The following are the conclusions reached:—

"The trypanosome studied (*T. evansi*) differs basically in its antigenic composition from bacteria: nearly 60 per cent. of the trypanosome cell is lipoidal in nature and extractable with alcohol and ether and only 2–6 per cent. C substance; in contrast to this, the bacterial cell contains 14–16 per cent. C substance and only 12–15 per cent. lipoids.

"The C substance of bacteria is readily hydrolysed by N/1HCl in 30 minutes, while that of the trypanosome is only partially hydrolyzed by heating for 2 hours with 2N/HCl.

"The various fractions of the trypanosome are non-toxic as tested by the Schwartzman phenomenon.

"The injection of the lipid fraction into rats produces a positive Wassermann reaction, but does not enhance resistance to infection.

"It is suggested that the antigenic peculiarities of the trypanosome are ascribable to the lipoids which constitute the major part of the cell."

W. Y.

KROÓ (H.). Die spontane, apathogene Trypanosomeninfektion der Kaninchen. [**Spontaneous Apathogenic Trypanosome Infection of Rabbits.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. May 30. Vol. 88. No. 1/2. pp. 117–128. With 2 figs.

There is little reference in the literature to spontaneous trypanosomal infection of the rabbit. The author encountered such an infection and made a careful study of the parasite. *Trypanosoma nabiasi* is morphologically indistinguishable from the rat trypanosome. Division forms, other than forms with a double blepharoplast which were exceedingly common, were not found in the peripheral blood. The trypanosome was readily cultured on N.N.N. medium at room temperature.

The infection appears to be widespread in the region of Madrid and in North-West Africa. Of 370 tame rabbits examined, no less than 122 (32.9 per cent.) harboured trypanosomes. The infections were much commoner in the summer months (43 per cent.) than in the spring (17.2 per cent.). BRUMPT classifies *T. nabiasi* amongst the trypanosomes which are transmitted through the dejecta of fleas. As a rule, a large proportion of infected animals is only encountered when fleas are present. Amongst the standard animals raised at the Institute of Animal Biology at Madrid no trypanosomes were found in 9 adult and 14 young rabbits, whereas among rabbits infested with fleas 5 of 13 adults and all of 8 young animals were infected. Pregnant rabbits, which had recovered from the infection, were cleared of fleas and placed in an insect-proof room. Their young, 43 in number, which were found to be free from trypanosomes, were placed in intimate contact with infected rabbits, and within a month had all become infected.

From this it is concluded that under favourable conditions all young animals become infected, and that the incubation period is about 2 weeks.

In natural infections the concentration of trypanosomes in the blood reaches its maximum (3-10 to a field) in 3 to 5 days. The number remains more or less constant for a long time (52-218 days) and the infection then terminates by crisis or more slowly during several days. Relapses do not occur; and the animals show no signs of disease. In artificial infections the number of trypanosomes in the blood is smaller and the duration shorter; subinoculations often fail.

Animals which have recovered from the infection are immune. The serum of such animals contains a trypanocidal substance, the action of which can be demonstrated *in vitro*. Certain therapeutic observations showed that *T. nabiasi* differs from other non-pathogenic trypanosomes in that it is susceptible to the action of such compounds as atoxyl, arsenophenylglycin, neosalvarsan, stibosan and germanin. Details of these observations are given in a table. W. Y.

COLLIER (W. A.) & VERHOOG (M. J.). Ein "Goldphänomen" bei der Trypanosomeninfektion der Maus. [**A Gold Phenomenon in Trypanosomal Infection of the Mouse.**]*—Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Aug. 4. Vol. 88. No. 5/6. pp. 509-528. With 13 figs.

Generally speaking gold preparations act more or less favourably on spirochaetal and coccal infections, but not on trypanosomal infections. The phenomenon described by the authors is that certain gold preparations, which are themselves inactive in trypanosomal infections, can nevertheless render the infection more sensitive to true trypanocidal medicaments.

The gold preparations used were (1) Auro-Detoxin (Type 70), which has been shown to be active in streptococcal and pneumococcal infections in rabbits; (2) Auro-Detoxin, which is very active in streptococcal infections of the mouse, and, like the previous compound, active in *Spirochaeta recurrentis* infections; (3) Lopion, which is relatively non-toxic and has a slight action on *Sp. recurrentis*; and (4) Krysolgan, which is highly toxic and has a slight action on *Sp. recurrentis*.

The results, which are given at length, show that the previous or simultaneous administration of all these gold compounds enhanced the action of various arsenical compounds, Bayer 205 and trypaflavine; they did not increase the action of tartar emetic however. This increase in activity was also observed with a salvarsan-fast strain of trypanosomes. W. Y.

TRILLAT (A.). Guérison d'une trypanosomiase expérimentale chez la souris par inhalation de vapeurs de Moranyl. [**Cure of Experimental Trypanosomiasis in the Mouse by Inhalation of Moranyl.**]*—Bull. Acad. Méd.* 1936. July 21. 100th Year. 3rd Ser. Vol. 116. No. 27. pp. 75-77.

Mice infected with *T. brucei* were exposed under a bell-jar of 20 litres capacity to an invisible cloud of a 10 per cent. solution of moranyl. It was found that inhalation of relatively short duration and of very small doses of the solution sufficed to arrest the infection, *e.g.*, inhalation of 0.75 mgm. per 25 gm. of mouse prevented any relapse during an observation of a month. W. Y.

SOULIÉ (P.). Sur une nouvelle trypanosomose équine en Syrie. Considérations épidémiologiques. Essai d'identification. [**On a New Equine Trypanosome of Syria.**—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 777-785. With 2 figs.

An account is given of a trypanosome discovered in a number of horses in north Syria, which the author believes to be *T. evansi*.

W. Y.

AMERICAN TRYPANOSOMIASIS.

KOFOID (Charles A.). **American Trypanosomiasis. The Northward Extension of Brazilian Trypanosomiasis, or Chagas' Disease, among Mammals in California.**—Fifth Pacific Science Congress.—pp. 3075-3078.

This short paper contains nothing new. It emphasizes the fact that the endemic infection of *Triatoma protracta* is, so far as is known, localized in California to bugs living in the nests of wood rats. *T. protracta* is found as far north as northern California and Utah, and the wood rats extend further north into southern Oregon. It thus appears possible that human trypanosomiasis has a potential extension throughout the tropical and temperate Americas on the Pacific Coast. W. Y.

MAZZA (Salvador). Nota sobre el primer centenar de formas agudas de enfermedad de Chagas comprobadas en la República por la Misión de Estudios de Patología Regional Argentina. [**The First Hundred Cases of Chagas's Disease in the Argentine.**—*Prensa Méd. Argentina.* 1936. Aug. 19. Vol. 23. No. 34. pp. 1979-1981. With 1 map.

This article analyses 109 acute cases of American trypanosomiasis observed by a Commission from the University of Buenos Aires in 1932. The article cannot be abstracted, but the following remarks may be useful. A sketch map indicates the Provinces with the number of cases in each. In the littoral Provinces there were 31, of which 27 were in Santa Fé and two each in Entre Rios and Corriente; in the Northern 39, viz., 14 in Santiago del Estero, 10 each in Chaco and Jujuy, 4 in Salta and 1 in Formosa; in the central zone, Córdoba, 2; in the West 37, viz., 22 in Mendoza, 10 in Catamarca, 3 in La Rioja and 2 in San Juan. Seven deaths occurred among the 109 cases; 4 among the 27 in Santa Fé, one each in Santiago del Estero, San Juan and Mendoza.

H. H. S.

MAZZA (Salvador). Investigaciones sobre la enfermedad de Chagas. Comprobaciones de casos agudos de enfermedad de Chagas en nuevas partes de la zona biológica chaqueña (Formosa, Chaco, Salteño). Hallazgos epidemiológicos especiales de la región. [**Chagas's Disease. Cases in Fresh Districts of Chaca.**—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy.* 1936. Publicación No. 27. 48 pp. With 38 figs. [20 refs.]

Every few weeks reports are received of new districts in which cases of infection by *T. cruzi* are discovered so that they no longer excite

much interest. The disease is probably widespread in South America, in Brazil, the Western Argentine, Venezuela, Guatemala and elsewhere. The chief point of interest in this article is the description of *Psammolestes coreodes* as the vector, the comparison between the various descriptions of it by different authors (which is presented in a table) and the discussion as to whether it is a valid species or not. H. H. S.

NIÑO (Flavio L.). Verbreitungsgebiet der Triatomidae (Hemipt.-Heteropt.) in Argentinien und Beschreibung einer neuen Art. [**Distribution of Triatomidae in the Argentine with a Description of a New Species.**]—*Ztschr. f. Parasitenk.* 1936. Aug. 3. Vol. 8. No. 5. pp. 606-610. With 2 figs.

Triatoma infestans occurs all over the Argentine between the Andes in the West and the Atlantic, the La Plata and Uruguay in the east, and between a line 22°S. in the north and 41°S. in the south. *Triatoma infestans* is the most widespread member of the family, but about 10 other species are also found. In a table is given the percentage of *Triatoma infestans* found to be infected with *Trypanosoma cruzi* in the various provinces. The paper concludes with a brief description of a new species, *Triatoma rosenbuschi* Mazza, 1936. [Mention of this species has already been made in this *Bulletin*, 1936, Vol. 33, p. 676.]

W. Y.

ROZEBOOM (L. E.). *Triatoma dimidiata* Latr., found Naturally Infected with *Trypanosoma cruzi* Chagas in Panama.—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 481-484.

Bugs collected in one of the poorer houses in the town of Chorrera about 21 miles west of Panama City were found to be infected with *T. cruzi*. These bugs were identified by N. G. BARBER as *Triatoma dimidiata* Latr. and are the fourth Reduviid incriminated as a vector of Chagas's disease in this region. The other known vectors are *Triatoma geniculata*, *Rhodnius pallescens* and *Eratyrus cuspidatus*.

W. Y.

KOFOID (Charles A.) & WHITAKER (Bruce G.). **Natural Infection of American Human Trypanosomiasis in Two Species of Cone-Nosed Bugs, *Triatoma protracta* Uhler and *Triatoma uhleri* Neiva, in the Western United States.**—*Jl. Parasitology.* 1936. June. Vol. 22. No. 3. pp. 259-263.

The discovery of *T. cruzi* in *Triatoma protracta* by Kofoid and McCulloch in 1916 was the first report of the occurrence of the causative organism of Chagas's disease in the United States. In the present paper the authors report the discovery of the trypanosome in a second species of cone-nosed bug, *Triatoma uhleri*, Neiva, collected in the vicinity of Tucson, Arizona. The infected bugs were found in houses and in beds.

W. Y.

GALLIARD (Henri). Recherches sur les reduvidés hématophages *Rhodnius* et *Triatoma*.—*Ann. Parasit. Humaine et Comparée.* 1935. July 1, Sept. 1 & Nov. 1. Vol. 13. Nos. 4, 5 & 6. pp. 289-306; 401-423; 497-527, & 1936. Jan. 1, Mar. 1 & May 1. Vol. 14. Nos. 1, 2 & 3. pp. 1-34; 97-112; 193-205. With 57 figs. [79 refs.]

DIAS (Emmanuel). O "Signal de Romaña" e os novos progressos no estudo da doença de Chagas. [*Romaña's Sign in Chagas's Disease.*] —*Folha Med.* 1936. July 25. Vol. 17. No. 21. pp. 345-347. With 2 figs.

Romaña's sign, so-called after Dr. Cecilio ROMAÑA who first described it, has the following characteristics.

1. Swelling of lids and conjunctiva of one eye, usually sudden in onset.
2. Painless oedema and a reddish-violet discoloration of the lids.
3. Hyperaemia and oedema, even to actual chemosis, of the conjunctiva, but cornea not affected, and conjunctival secretion scanty.
4. Extension of the swelling on the same side.
5. Enlargement of correlated glands, pre-auricular, parotid or submaxillary.
6. Slow subsidence of the swelling.

The author does not state in so many words that the site of the swelling is incidental to the primary lesion, *i.e.*, accidental when the bug bites the region in question. The sign is evidently fairly common, "llamativo" as the Argentines call it, that is "pathognomonic."

H. H. S.

ROMAÑA (Cecilio). Relato y comentarios acerca de tres casos agudos de enfermedad de Chagas.—*Folha Med.* 1936. July 25. Vol. 17. No. 21. pp. 314-319. With 4 figs.

KELSER (R. A.). **A Complement-Fixation Test for Chagas' Disease employing an Artificial Culture Antigen.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 405-415. [12 refs.]

A complement fixation test for Chagas's disease is described; this is a modification of the Machado reaction, the essential difference being that the author employed an artificial culture of the trypanosomes as antigen instead of infected organs.

Kelser points out that earlier work had shown that the extent of infection of the organs and the potency of the antigens made from them varied markedly. He at first therefore attempted to produce conditions in experimental animals which would render them more susceptible to the disease, with the hope that there would be a marked increase in the number of parasites in the blood. Such measures consisted in subjecting the experimental animals to heavy doses of X-ray, in blocking of the reticulo-endothelial system by colloidal copper, and in splenectomy; but as all these methods failed to accomplish the desired results, the author attempted to produce a satisfactory antigen by the use of artificial cultures of *T. cruzi*.

The medium used was a slight modification of that described by BONACCI (No. 4 preparation) for the propagation of *T. cruzi* [this *Bulletin*, 1935, Vol. 32, p. 721]. Kelser used the desiccated media ingredient prepared by the Difco Laboratories (Detroit, Mich.) and the details of preparation of his medium are as follows:—

To a flask containing 500 cc. of distilled water, 25 gm. of dehydrated "Bacto-Beef" are added and the flask placed in a water-bath at 55°C. for 1 hour; then 12.5 gm. of "Bacto-peptone" and 3.5 gm. of sodium chloride are added and the mixture after boiling for 5 minutes is filtered through absorbent cotton. The broth is made neutral to litmus by the addition of N/1 sodium hydroxide solution. It is then measured, placed in a boiling water bath, and 1.0 per cent. granular "Bacto-agar" added.

As soon as the agar has dissolved, the medium is distributed without filtering into sterile test tubes or 50 cc. Erlenmeyer flasks, 5 cc. being placed in each test tube and 10 cc. in each flask. Sterilization is accomplished by autoclaving at 12 pounds pressure for half an hour. This base is stored in the refrigerator, and when ready for use the tubes or flasks are placed in a boiling water bath until the agar is melted; the temperature is then lowered to 50° to 55°C. and to each tube are added 0.25 cc. of a sterile 1 per cent. solution of dextrose and 0.25 cc. of fresh, defibrinated guineapig blood; the tubes are then slanted so as to give a relatively small slanted surface to a deep butt. In the case of the flasks twice as much dextrose solution and blood are added and the medium permitted to harden at the bottom of the flasks. Before inoculation of the flasks, the small amount of water of condensation in each is augmented by the addition of 2 cc. of a mixture of 1 part of 1.0 per cent. sterile dextrose solution and 2 parts of peptone broth made as described for the preparation of the basic medium. This is unnecessary, as a rule, in the case of the tubes, but as the cultures become older, 0.10 cc. of the dextrose broth medium can be added where there is a danger of complete loss of the water of condensation through evaporation.

The cultures, which are incubated between 24° and 30°C., are transplanted at approximately 10-day intervals, although most cultures survive a month or more if they are not allowed to become dry. Occasionally, the cultures were passed through young guineapigs. These animals and rats are readily infected with the culture and the organism can easily be recultivated from them.

In order to start a culture 0.2 cc. of defibrinated blood of an infected animal is inoculated into the water of condensation in a culture tube. *Leishmania* forms, growing in clusters, are usually seen in from 3 to 5 days, and a few days later large numbers of flagellated forms are to be found. In subcultures the growth becomes very heavy within a week and can be seen as a white deposit in the lower part of the water of condensation.

As a single flask usually yields as many organisms as 5 to 6 tubes it is more convenient to prepare the antigen from flask cultures. The fluid portion of each flask is drawn off: 1 cc. of distilled water is added to the flask to wash up the remaining organisms, and this is then withdrawn and added to the previously removed fluid. The trypanosomes are deposited by means of a high speed centrifuge, the supernatant fluid removed and the trypanosomes washed in sterile physiological saline. To the washed organisms are added two volumes of 50 per cent. glycerine in physiological saline and the mixture allowed to stand in the refrigerator for 24 hours. For titration the stock antigen is diluted with 20 or 25 parts of physiological saline. When kept at low temperatures the antigen is usable for as long as a month, but there is a drop in titre as it ages. The antigen should be titrated within a day or two of its use in testing serum specimens.

An account is given of the method adopted for the titration of the antigen and for the performance of the test. It is recorded that this complement-fixation test has been used in testing over 400 serum specimens including a number from known cases of Chagas's disease in man and lower animals. It has proved positive in all known cases of the disease from which sera were available, and negative where there was no evidence of Chagas's disease. No cross reactions occurred with Wassermann-positive sera; and serum specimens from guineapigs infected on *T. equiperdum* gave no reaction when tested with the antigen.

W. Y.

MALARIA.

BARBER (M. A.). **A Survey of Malaria in Cyprus.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 431-445. Also in *Cyprus Ann. Med. & San. Rep.*, 1935. Appendix D. pp. 62-69.

This is an interesting and informative record of a survey that was carried out between June 22 and August 2, 1935, during which nearly all parts of the island were visited. Twenty-five villages were carefully surveyed. Of the combined village population of 13,474, children to the number of 1,089 were examined. These showed a parasite rate of 36.6 per cent. and a spleen rate (Ross method) of 40.9. These figures are evidence of the large amount of malaria in the island. The opinion is expressed that a survey in September or October would reveal higher indexes.

Of the 399 positive blood films 33.3 per cent. were *vivax*, 42 per cent. *falciparum* and 24.5 per cent. *malariae*. There was no definite association of a species of malaria parasite with the species of *Anopheles* prevalent in the village. The two chief malaria vectors are *elutus* and *superpictus*. No *maculipennis* were found though thorough search was made. *A. bifurcatus* was found at high elevations. *A. multicolor* was present but not in large numbers. No close relation was noted between the density of anophelines and the amount of malaria at the time of visit.

The results of mosquito dissection were as follows :—

Species.				No. dissected.	Sporozoite positive per cent.
<i>A. elutus</i>	...	...	...	428	1.8
<i>A. superpictus</i>	...	...	...	1,134	7.8
<i>A. multicolor</i>	...	...	...	37	0.0

The percentage of positive findings amongst *superpictus* is far greater than that found in Greece and exceeded that found by the author among *A. costalis* in West Africa. There appeared to be, however, less malaria transmission by a given percentage of infected *superpictus* than by the same or a lower percentage of infected *elutus*.

The precipitin test with the stomach contents of anophelines gave interesting results: deviation of mosquitoes to domestic animals is less in evidence than in many malarious countries. Thus of 150 *elutus* (of which 17 were caught in stables) which gave a positive reaction 82.6 per cent. were positive for man. The number of cattle and other domestic animals in the villages at night is small.

The amount of malaria in Cyprus is out of proportion to the relatively small amount of water available for anopheline breeding during the rainless summers. The author agrees with the conclusion of Ross that in Cyprus an attack on the mosquitoes is the measure most likely to give the best results.

Norman White.

BARBER (M. A.), RICE (J. B.) & MANDEKOS (A. G.). **The Relation of the Density of the Anopheline Mosquitoes and the Transmission of Malaria.**—*Amer. Jl. Hyg.* 1936. Sept. Vol. 24. No. 2. pp. 237-248.

The observations described were undertaken in two groups of villages in Greek Macedonia, one in the Nestos Valley near the sea, an area of high endemicity, the other in the plain of Philippi, where

endemic malaria is less severe. The inquiry was restricted to *Anopheles elutus* (*sacharovi*). *A. maculipennis* (*typicus* and *messeae*) was almost as prevalent but it was found to possess so high a deviation to domestic animals that the rôle it plays in the transmission of malaria must be unimportant. From 1932 to 1935 the malaria parasite index of infants under one year of age was compared with the density of *A. elutus*. The density index is the average number of adult mosquitoes per collection in village houses and stables.

It was found that malaria transmission was more or less proportional to the density of *elutus*. There was a lower limit of density, measurably above the extinction point, at which transmission nearly ceased. During the earlier years of the inquiry the sporozoite index was nearly the same in the areas of high and low *elutus* density respectively. The authors realize that an approximation is all that can be expected in an inquiry of this kind: numerous factors are involved, some of which are difficult to measure. Such approximations are, however, of value in appraising the value of antimalaria work. N. W.

JACKSON (R. B.). **Investigations into the Habits and Pathogenicity of the Anophelines met with in Two Localities in Hong Kong during 1931-1935.**—*Chinese Med. Jl.* 1936. Aug. Vol. 50. No. 8. pp. 1098-1113. With 2 maps.

Two circumscribed areas in Hong Kong have been kept under special observation for five years with the object of studying the breeding, seasonal prevalence and habits of anophelines. In one, Pokfulam, *A. maculatus* was most in evidence. Though a recognized carrier of malaria and easily infected in the laboratory, it plays no part in the spread of malaria in this area. Precipitin tests showed that cattle were the chief source of its food supply. The breeding of *A. minimus* was localized and restricted to certain months of the year; malaria infections were likewise restricted to the neighbourhood of *minimus* breeding places. This species appeared to be the only vector of importance.

In the second area, Little Hong Kong, in addition to the two species already mentioned *A. jeyporiensis*, *A. hyrcanus* and *A. tessellatus* were found. The last named was rare; one specimen taken had a midgut infection. *A. minimus* and *A. jeyporiensis* were both found to be important carriers of malaria. Both were also found harbouring filaria apparently derived from human sources. N. W.

EARLE (W. C.). **The Relative Importance of *Anopheles tarsimaculatus*, *Anopheles argyritarsis*, and *Anopheles pseudopunctipennis* as Vectors of Malaria in the Windward Group of the West Indies.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 459-469.

This is a record of observations made in the islands of Grenada and St. Lucia. In the former very heavy rainfall in a mountainous island limits malaria to a relatively small part of the coastal belt. In St. Lucia there are swampy areas adjacent to towns and two heavily populated river valleys in which parasite indexes over 50 per cent. were found.

A. tarsimaculatus was present wherever there was malaria ; it was readily found in human dwellings, showed a predilection for human blood, was found infected and was readily infected in the laboratory. It appeared to be responsible for most if not all of the malaria in the two islands.

A. argyritarsis was less prevalent. It was much less often found in houses and has a less marked preference for human blood. It is, however, easily infected in the laboratory.

A. pseudopunctipennis was found in Grenada but not in St. Lucia. Its distribution was not closely related to that of malaria : it is most prevalent when malaria is least in evidence. It is not easily infected in the laboratory. It is probably of no importance as a vector of malaria in Grenada. N. W.

SCHOURENKOVA (A.) & MEKHANIKOVA (V.). La répartition des espèces de l'hématozoaire du paludisme dans certains foyers endémiques du Tadjikistan. [**Distribution of the Different Species of Malaria Parasites in Tadjikistan.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 379-392. French summary p. 393.]

The authors have examined the population of three villages in Tadjikistan (Middle Asia), with a total of 600-800 inhabitants, every three months during the years 1935-1936, with the view of establishing the seasonal and age distribution of the malaria parasites. In the course of these examinations all the recognized malarial indices were recorded. The present paper contains an analysis of the specific distribution of the parasites. The distribution curve shows two peaks, one in spring and the other in autumn. In spring *P. vivax* and *P. falciparum* are present in equal numbers, in autumn the M.T. form is predominant. The quartan parasite is rarely encountered and never in summer. The spring increase of the parasite-index is due chiefly to infections in children (3 to 5 years old), in autumn the incidence amongst children and adults is about the same, B.T. being prevalent in the former and M.T. in the latter. The only local vector is *Anopheles superpictus*. C. A. Hoare.

COLONIAL DEVELOPMENT FUND (MALARIA RESEARCH SCHEME). **Report of the Malaria Unit, Tanganyika, 1933-34, together with a Report on a Study of Malaria in India** [WILSON (D. B.), M.A., B.Ch., M.R.C.S., etc.].—71 pp. With 4 maps & 16 figs. [11 refs.] 1936. Dar es Salaam : Govt. Printer. [Shs. 10s.]

The most interesting part of this Report was embodied in a paper by Dr. Wilson entitled Rural Hyperendemic Malaria in Tanganyika Territory, which has been summarized already in this *Bulletin*, 1936, Vol. 33, p. 765. In Tanganyika itself and also in Arnani, though there is a good deal of malaria there is very little transmission, the inhabitants who are always on the move contract the disease outside the townships. The greater part of the occupied area on Kilimanjaro is healthy, but there are areas at the foot of the mountain, such as Taveta, which are very malarious, and in some the conditions of malaria in mixed communities obtain ; one of these is a part of Moshi township. The

principal carrier everywhere is *A. gambiae*, which loves still or slowly moving water open to the sun. *A. gambiae* constituted seven-eighths of the anopheline infestation found during this survey. The other important anopheles is *A. funestus*, which breeds in places lying out of the sun, under vegetation. Its comparative uncommonness in the places investigated is attributed by the author to lack of suitable breeding places.

W. Fletcher.

BISHOP (E. L.). **Malaria-Control Activities of the Tennessee Valley Authority.**—*Public Health Rep.* 1936. July 17. Vol. 51. No. 29. pp. 970-975.

Very few large-scale engineering enterprises have been undertaken with as much forethought for the possible public health consequences of the undertaking as is disclosed in this short report of the Director of Health of the Tennessee Valley Authority. All concerned in the enterprise take into account measures designed to prevent mosquito breeding that might increase the transmission of malaria along the 2,300 miles of impounded reservoir shore line. The report describes the manner in which the consideration of engineering and public health problems is co-ordinated.

N. W.

BLACKLOCK (D. B.). **Studies in Rural Hygiene in the Tropics. II. The Cultivation of Dense Shade Plants as an Anti-Malaria Measure.**—*Ann. Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. pp. 181-186. With 3 figs. on 1 plate.

In many parts of Assam both surface and sub-surface drainage has failed as an anti-malaria measure. It has, indeed, in some places, made matters worse. This experience is in striking contrast with that of Malaya. Among the reasons advanced to explain the failure are the much heavier rainfall of Assam, concentrated within a period of a few months, and the flatness of the ground, making it difficult or impossible to get sufficient fall. Contour open drains may be washed out by heavy rain and made dangerous. Sub-surface drains fail to deal with the great volume of water. The drainage has lowered the surface water in places; what were impassable swamps are now used for rice cultivation but the prevalence of *A. minimus*, the chief vector, has been increased. The fundamental reason for failure is probably the lack of sufficient fall in the tributaries of the large rivers and in the large rivers themselves.

In areas where drainage has failed shading streams with dense artificial shade is meeting with success where the chief vector is *A. minimus*. In Assam many plants have been used for this purpose including Basak, Lantana, Eupatorium, Tarapat, Hibiscus, Durantha and Bamboo. The shade must be really dense, excluding sun from the water so that no green vegetation grows in it. Such vegetation, to which the larvae can cling with their tail-hooks, would seem to be necessary for *A. minimus*: in the absence of this the larvae will be washed away. The natural jungle cover does not usually provide sufficiently dense shade. Really dense shade of the nature described might eliminate the breeding of many other species, even shade-breeding species, in other parts of the world. In any case a thorough experimental trial in suitable places would seem to be worth while.

N. W.

WILLIAMS (L. L.), Jr. **Factors concerned in Malaria Control by Drug Treatment.**—*Southern Med. J.* 1936. July. Vol. 29. No. 7. pp. 743-746. [12 refs.]

In this, the Chairman's address to the National Malaria Committee, an attempt is made to weigh the value of the attempts that have been made to control malaria through drug administration. It is pointed out that in any such attempt consideration must be given to finding the infected individuals; curing the infection; preventing relapses (or preventing carriers from infecting mosquitoes) and preventing the importation of new cases. Reference is made to many of the outstanding reports dealing with this question that have been published during recent years, summaries of which have been published in this *Bulletin*. The conclusion of this interesting address is that "malaria control through the administration of drugs is not a hopeful procedure. Successful in reducing clinical attacks of malaria, it offers little hope for controlling the malaria rate, is difficult to apply, and is uneconomical."

N. W.

SWELLENGREBEL (N. H.), DE BUCK (A.), SCHOUTE (E.) & KRAAN (M. H.). **Investigations on the Transmission of Malaria in Some Villages North of Amsterdam.**—*Quarterly Bull. Health Organisation. League of Nations.* Geneva. 1936. June. Vol. 5. No. 2. pp. 295-352. With 3 figs., 2 diagrams & 5 maps.

In the villages of Wormerveer, Uitgeest and Marken, malaria transmission is limited to the autumn, semi-hibernating *A. maculipennis atroparvus* being alone responsible.

With some rare exceptions infection of *A. maculipennis atroparvus* is limited to females which have entered upon their term of semi-hibernation in the second half of August. The scarcity of infections in the summer is not entirely due to the mosquitoes entering stables at that time but is considered by the authors, in accordance with JAMES's experiments, to be the result of the shortened span of life at that season associated with sexual activity. *A. maculipennis messeae* (identified by the rod-like form of the salivary glands) shares its autumnal quarters with *atroparvus*, but only once was a female found infected. Autumnal infections of *atroparvus* are most numerous in houses which contain many children under 16, among whom there are carriers of plasmodia without obvious clinical symptoms ("healthy" carriers). Houses of this type may remain foci of anopheline infection for at least two successive autumns without fresh cases of malaria occurring in them. The infected *Anopheles* show little tendency to move to neighbouring houses. During the winter the oöcysts and sporozoites degenerate; this process begins in November and is so far advanced by January that the mosquitoes are no longer infective. The authors recommend the spraying of houses once a fortnight from the middle of August to the end of October to control autumnal infection; the work to be done preferably by trained personnel. Where rigorous economy is needed, the operations may be confined to houses containing numerous children under 16. The authors emphasize that treatment of malaria will not prevent anopheline infection if, as often happens, the relapses are not severe enough to make the patient seek medical advice, so that he becomes a "healthy" carrier. They attach more importance to such carriers than to malaria patients as sources of infection.

V. B. Wigglesworth.

LANDEIRO (F.) & CAMBOURNAC (F.). O sezonismo em Portugal.—Colecção de Relatórios, Estudos e Documentos Coloniais. [**Malaria in Portugal.**]—7th Ser. No. 28. 142 pp. With 34 figs., 3 folding maps & 1 chart. [21 refs.] English summary. 1935. Lisbon : Divisão de Publicações e Biblioteca, R. da Prata, 34.

This is a well documented report on the geographical distribution and prevalence of malaria throughout Portugal. Malaria is a serious cause of morbidity in the River basins of the Sado, the Tagus (including the upper reaches of the Guadiana), the Mondego and the upper Douro. Elsewhere endemic areas are more circumscribed. The highest spleen index (95 per cent.) and the highest parasite index (34 per cent.) were both found in the Setúbal District near the mouth of the Sado. The only anophelines found in Portugal are *A. maculipennis atroparvus*, *A. maculipennis maculipennis* (*typicus*) and *A. bifurcatus*. Of these *atroparvus* alone appears to be of importance as a vector of malaria in Portugal. It was found alone in the areas of most severe malaria. Malaria in Portugal is intimately associated with rice cultivation. A floating labour population plays an important part in the spread of the disease. N. W.

BARBER (M. A.), MANDEKOS (A.) & RICE (J. B.). **The Seasonal Incidence of Malaria Transmission in Macedonia.**—*Amer. J. Hyg.* 1936. Sept. Vol. 24. No. 2. pp. 249–267. With 1 chart.

This very interesting study is based, for the most part, on the examination of 1,578 infants of one year or less in 31 villages of Greek Macedonia and 14 villages in the plain of Lamia during the years 1932–1935 inclusive. The great majority of the examinations were made in Macedonia. The authors remark that the possibility of prenatal infection cannot be wholly excluded: of 44 children under 10 days of age examined one, aged 7 days, had numerous rings of *P. falciparum* in the peripheral blood. The occurrence is, however, a rare one in Macedonia. For the purpose of the inquiry 10 days was taken as the minimum incubation period.

It was found that very little transmission, possibly none through anophelines, takes place between December and April; transmission does occur in May and June and reaches its maximum in July, August and September. There is a very small amount of transmission in October and November.

P. vivax predominates in the spring months, continues through the summer and is present in autumn and winter. In the late summer and through the winter *P. falciparum* is predominant. *P. malariae* is relatively rare before September or October. The reasons underlying this seasonal prevalence of the different species are only briefly discussed. It is pointed out that *vivax* greatly predominates in the spring in both primary cases and relapses; that infection with it continues through July and probably later, and that it is easy to infect anophelines in the laboratory with *vivax* in August and September and that sporozoites are formed in abundance. *A. falciparum* has the advantage that an individual harbouring many gametocytes may continue to infect anophelines for three or four weeks in spite of taking quinine.

Older infants were found to be more susceptible to infection than the younger ones. Such insusceptibility of the younger infants is in no sense complete: two infants were found infected after 20 and 24

days of life ; three after 4 to 5 weeks of life and 18 after 6 to 10 weeks. Factors contributing to the lesser prevalence in the early months may be found in the facts that at about six months of age part of the swaddling clothes are removed and the infants are partially weaned, with attendant liability to digestive upset.

Confirmation of the absence of malaria transmission during the winter is furnished by war experience in Macedonia and by the Vlachas. The Vlachas are shepherds who pass the summer in the mountains, the winter in the plains where malaria is endemic. They are free from malaria.

During the past 4 years *A. elutus* has been much the most important, if not the only effective, vector. The sporozoite index of *elutus* is highest in August, but infected anophelines may be relatively numerous even in winter. Laboratory experiments have shown, however, that the rate of oöcyst development is low in October and November and probably throughout the winter : nearly three-quarters of the sporozoites in winter are wholly or partially degenerated. The transmission of malaria does not run parallel with the sporozoite index but it is intimately related to the density of *elutus* and its biting activities. Lessened biting activity is shown by large fat deposits and decrease in the number of anophelines with well matured eggs. Biting activity was also studied directly by means of the precipitin test. Temperature and the density and biting activities of mosquitoes are considered the most important factors in the transmission of malaria and these factors are most favourable for such transmission about midsummer. N. W.

RANKOV (M.). Ueber die Malariakurven am Balkan. [**Malaria Curves in the Balkans.**].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 373-381. With 7 figs. [43 refs.]

A study of 75,480 cases of malaria in eight malaria stations in South Serbia during the period 1928 to 1932.

In all cases the diagnosis was confirmed by microscopic examination. The yearly course of malaria was charted by means of curves, both for each variety, and for the combination of all varieties. From an investigation of post-war conditions amongst colonists and troops it was demonstrated that the spring epidemic of malaria was due to relapses, whilst the aestival-autumnal peak was chiefly produced by infections from new *Anopheles* generations.

In addition to the routine investigations of the malaria stations the yearly course of malaria was studied and graphically recorded from the point of view of the parasitic indices, which were determined monthly during 1928 in 5 villages and 32 schools. E. D. W. Greig.

SOVIET UNION YEAR BOOK PRESS SERVICE. **Decline of Malaria in USSR.** [Mimeographed statement issued 24th September, 1936.]

The following official account of malaria in the U.S.S.R. is of interest in showing the intensive efforts undertaken by the Government to deal with this disease : " According to Professor SERGIYEV, head of the Malaria Department of the Commissariat of Health and director of the Central Tropical Institute, during the first six months of 1936 there was a drop of about 35 per cent. in the number of malarial cases and of 40 per cent. in the number of deaths from malaria in U.S.S.R. as compared with the corresponding period of 1935.

"During the first half of 1936 the appropriate bodies of the Commissariat of Health examined 19½ million children. Symptoms of malaria were thus detected early and systematic treatment applied. The Soviet synthetic preparations—plazmotsid and akrykhin—were more widely used than before. These preparations were tested by the international standard test of the Malarial Commission of the League of Nations by the Martsinovsky Tropical Institute.

"In the efforts to wipe out the malaria-carrying mosquito, 2·5 million infested acres were sprinkled with oil, partly by airplanes. Mosquito netting was introduced into the badly infested areas, 200,000 screens being distributed to collective farmers. During the summer 500 groups of doctors and senior medical students joined the fight being carried on by 1,800 permanent malaria organisations. Fifty-thousand collective farmers took part in the oil sprinkling and in the delivery of medicines. The entire forces struggling against malaria were led by 236 malaria specialists, and during the campaign 1,500 doctors and 2,500 assistant doctors working in the villages received special anti-malaria training."

BALTEANU (I.), ALEXA (I.) & ALEXA (E.) with the collaboration of I. RUGINA, I. STRETCU, V. BOERU & I. URZICA. Contributions à l'étude de certains problèmes paludéens mis à l'étude par la commission du paludisme de la Société des Nations. (a. La gravité de la maladie d'après le groupe d'âge. b. Lutte antipaludéenne par la méthode du traitement.) [(a) **Malaria in Different Age Groups.** (b) **Treatment as a Weapon against Malaria.**—*Arch. Roumaines Path. Expér. et Microbiol.* Paris. 1935. Dec. Vol. 8. No. 4. pp. 491-519. With 8 figs.

The authors carried out their observations in three villages (Osoi, Costuleni and Macaresti). The proportion of the three types of malaria in these regions is: benign tertian, 52; subtertian, 38; quartan, 6. An immunity to malaria develops with age: up to 15 years about 40 per cent. suffer from attacks of malaria; between 15 and 30 years of age, 15 per cent.; between 30 and 55 years, 10 per cent.; over 55 years, 5 per cent. Most of the relapses occur in children under 15. Attacks in adults are less severe and terminate in a few days after a little treatment, or even without it, but, in children, the attacks are severe.

W. F.

DUNN (C. L.). **Malaria in Ceylon: an Enquiry into its Causes. The Therapeutic and Other Measures used during the Epidemic of 1934-35, with Recommendations for the Prevention of Future Epidemics.** pp. vi + 57. With 4 maps & 4 graphs. [36 refs.] 1936. London: Baillière, Tindall & Cox, 7 & 8 Henrietta Street, Covent Garden, W.C.2. [6s.]

This report, well printed and produced, contains the results of an inquiry carried out by Colonel Dunn during a two months' stay in Ceylon at the close of 1935. It is based largely on official reports.

Deficient rainfall caused insufficient flushing of streams and rivers and the breeding places of *A. culicifacies* were thereby greatly increased. This fact in the presence of a sufficient number of gamete carriers among an unusually susceptible population, due to four years of low malaria prevalence, is, in the opinion of the author, sufficient to explain the genesis of the serious epidemic.

The therapeutics of malaria occupies an important part of the report. Most of the author's findings and recommendations with regard to this were published in the *Transactions of the Royal Society of Tropical Medicine and Hygiene*, July 1936 [this *Bulletin*, 1937, Vol. 34, p. 63]. Briefly the author considers quinine the only safe remedy for the mass treatment of malaria: quinine combined with plasmoquine, in non-toxic doses for short periods, is, however, recommended "with a view to reducing the relapse rate and attacking the sexual phase of the parasite of malignant tertian fever when present." [Much, perhaps undue, emphasis is laid on the toxicity of atebirin. Many with a large experience of atebirin in the treatment of malaria would be unwilling to subscribe to all the author says regarding the dangers attendant upon its use.]

N. W.

DAUER (C. C.) & FAUST (Ernest Carroll). **Malaria Mortality in the Southern United States for 1934 with Supplementary Data for Previous Years.**—*Southern Med. J.* 1936. July. Vol. 29. No. 7. pp. 757-764. With 5 figs.

This report is based on the official returns received from State Health Departments giving the number of deaths attributed to malaria in each county. A map is produced showing the distribution of malaria mortality for the five-year period 1929-33, from which it appears that there are two major and one minor endemic areas. The eastern major area includes parts of South Carolina, Georgia, Florida and Alabama. The western major area includes the south-east part of Missouri, the extreme western parts of Tennessee and Kentucky, the eastern half of Arkansas, the delta counties of Mississippi and north Louisiana. The minor endemic area includes a few counties in the south-west of Oklahoma, north-east Texas and south-west Arkansas. The average malaria mortality rate per 100,000 for the eastern area for the five-year period was 38.2, and for 1934, 50.7. Corresponding figures for the western area are 26.8 and 41.2. A graph showing annual mortality figures in the Southern States exhibits similar cyclic waves in both major endemic areas, but the peak years are a year earlier in the western than in the eastern area. This is a constant phenomenon for which no explanation is forthcoming.

The age distribution of malaria deaths in three States, for the coloured and white populations separately, is shown in a graph. As one would expect the mortality rates are high in the age group 0-4. The very high malaria mortality rates in the highest age groups are more unexpected and raise a suspicion of inaccuracies in the registration of causes of death, such as occur in many countries in which malaria is an important cause of sickness. This possibility is referred to by the author.

There has been no apparent decrease in malaria mortality during the last ten years in the Southern United States.

N. W.

GENKA (C.). Statistik der Malaria milztumoren in Formosa nebst ein Beitrag zur gasumsätzlichen Studien der chronischen Malaria. [**Malarial Splenomegaly in Formosa with a Note on Metabolic Exchanges.**—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1936. June. Vol. 35. No. 6 (375). [In Japanese. pp. 1251–1267. [20 refs.] German summary p. 1267.]

Malarial splenomegaly is common in Formosa; in many cases parasites are no longer found. In 1930 splenic enlargement was observed in 16.1 per cent. of the inhabitants; it is commonest in association with benign tertian infection 24.5–52 per cent., with subtertian 25–37 and with quartan 11–23.6 per cent. Great enlargement occurred among those under 10 years (25.3 per cent.) and in those in their third decade (20.6). Among the indigenous the rate was very high, 68 per cent., among Japanese only 2 per cent., and among other Formosan inhabitants 29 per cent.

In chronic malaria subjects the basal exchange was raised, the respiratory quotient reduced, as was also the blood CO_2 . H. H. S.

SERRA (G.). Contribution à l'étude du paludisme chez les enfants noirs.—*Bull. Méd. du Katanga*. 1936. Vol. 13. No. 1. pp. 1, 3–9, 11 12.

MANSON (D.). **Velocity, Silt and Larval Drift.**—*Indian Med. Gaz.* 1936. May. Vol. 71. No. 5. pp. 270–275. With 3 charts.

The Assam Malaria Research Officer had advised that anti-larval control should be continued during the first half of the year only. The author considers that this advice is bad because there are multitudes of larvae along the banks of the rivers outside the areas of control which are carried down stream into the protected zones. Another objection which he raises is that adult *Anopheles* would invade these zones by migrating from unprotected areas. He concludes that the danger of such a scheme cannot be estimated. He instances estates where all water-courses are completely dried up in the dry weather and where no breeding places can be found for miles, yet there is intense malaria in the rainy season. This malaria is due to the larvae being carried in by water from outside. He draws attention to the difficulty of dealing with the rapid rivers of Assam; "the present method of control is to oil *A. minimus* areas in permanent water in bamboo enclosures along the banks." "Velocities which exceed the average of 2.04 miles per hour . . . are inimical to larval life in Assam." W. F.

SCHARFF (J. W.). **Anti-Malarial Drainage from the Point of View of the Health Officer. Parts III & IV.**—*Malayan Med. Jl.* 1936. Mar. & June. Vol. 11. Nos. 1 & 2. pp. 40–52; 67–90. With figs. 16–29, 2 plans & 3 diagrams. [30 refs.]

These papers contain a vast amount of information on the subject of anti-malarial drainage, based, evidently, on a wide knowledge and experience of conditions in Malaya. Though there is little that is new, workers in this field might profit from a careful study of these papers. Technical details are admirably described and illustrated. The last paper concludes with a short dissertation on malaria control in general.

N. W.

WANSON (M.). Note sur un poisson culiciphage du Bas-Congo. [**A Larva-eating Fish of the Lower Congo.**]*—Ann. Soc. Belge de Méd. Trop.* 1936. Mar. 31. Vol. 16. No. 1. pp. 153-158. With 1 fig.

The author observed that certain pools on the sandy peninsula of Banana, at the mouth of the Congo, contained no mosquito larvae whereas, in other pools, they were present in great numbers. He found that the pools without larvae were connected with the creek at high tide, and that they were full of a larva-eating fish which had gained access in this way. The fish was identified as *Tilapia hendeloti*, and in the illustration given it looks something like a small perch. When introduced into other pools it increased rapidly. The young fish feed on larvae, the older specimens do not. They live, normally, in water with a salinity of 15 parts per thousand, but will flourish in much higher concentrations. They are destroyed by a concentration of 38 parts per thousand. W. F.

MULDER (J. G. A.). De malariabestrijding te Tjalang, Westkust van Atjeh. [**The Campaign against Malaria in Tjalang on the West Coast of Atjeh.**]*—Geneesk. Tijdschr. v. Nederl.- Indië.* 1936. July 28. Vol. 76. No. 30. pp. 1864-1889. With 8 figs. on 3 plates, 1 map & 5 figs.

The story which is unfolded in this article is one of intelligent application of measures that have only been adopted after a careful study of the local conditions. These relate to the carrier mosquito, the influence of heavy sea breakers, the effect of downpour in contradistinction to quiet rainfall and the formation of sand dunes as an obstruction to the drainage of lagoons and swamps. Tjalang is a military cantonment on the west coast at the northern extremity of Sumatra. It had acquired great notoriety as a malarial region and this was duly reported every year with a variety of explanation of the cause and consequent remedy. The withdrawal of the military garrison was even at one time suggested. In the course of one single year, however, the remedy seems to have been discovered and applied: the result has been that up to the end of March, 1936, Tjalang has, practically speaking, been free from malaria, while the cost of the measures taken has been low. The cantonment of Tjalang, 1 to 3 metres above sea level, is in somewhat close proximity to lagoons and swamps which contain, owing to the occasional incursion of the sea, brackish water. These lagoons are fed by streams from the hill range which is found along the entire length of the west coast of Sumatra. The region is not one of mangrove growth, but the lagoon and swamp areas, which have been drained by earth channels, were liable to have these channels silted up by the formation of sand dunes. Heavy rain, when it occurred, would result in a break through to the sea and a clean up of the area. Malarial incidence then showed a fall. Heavy breakers from the sea at some seasons of the year counteracted the effects of heavy rainfall and also supplied a brackish water in which *A. ludlowi* bred abundantly. This malaria-carrying mosquito was the cause of all the trouble. Attempts at drainage of lagoons had previously failed owing to want of appreciation of the necessity that the mouths of the drains had to be kept permanently open. This

was effected by altering their course so as to pass through rocky beach. Drains were also constructed of tree trunks and of cement. It is proposed that ultimately they shall be of iron and cement.

The general principle adopted, of which the details are set out in full, was to *drain first* before attempting to fill in swamps or raise levels. Whole areas have been rendered dry by what have been essentially drainage measures, although other methods such as the erection of dams have also been employed. It may now be said that endemic malaria has disappeared from Tjalang and it is suggested that what has been done for one place on the west coast of Sumatra can probably be done for others which are similarly placed. Excellent graphs, photographs, a map and tables are included in the text.

W. F. Harvey.

TENORIO NIETO (Alfonso). Notas sobre profilaxia anti-malarica en la mina "Asnazu." [**Antimalaria Measures in a Mining Community, Asnazu, Colombia.**].—*Rev. Méd. de Bogotá*. 1936. Jan.—Feb. Vol. 45. Nos. 533–534. pp. 201–221. With 7 figs.

A description of the measures taken to protect the personnel, numbering about 200, of the Asnazu Gold Dredging Co., Ltd., who work in an intensely malarious part of Colombia, and of the success attained. The vectors are *A. argyritarsis* and *A. pseudo-punctipennis*. The reduction in morbidity is in large measure attributed to the use of synthetic drugs.

N. W.

MIYAHARA (Hatsuo). **Clinical Studies on Malaria. I. On the Chloride Content of Blood.**—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1936. May. Vol. 35. No. 5 (374). [In Japanese pp. 1092–1127. [58 refs.] English summary p. 1127.]

"It is an established fact that when the CO_2 tension is increased, the chloride content of the blood plasma is reduced, being transferred to within the erythrocytes, and the sodium ions left free in the plasma are combined with CO_2 —the so-called Hamburger's phenomenon. The clinical symptoms in malaria point to the presence of acidosis, and accordingly the author undertook an examination of the blood chlorides in 106 cases of malaria. Employing Rusznyak's method of chloride estimation, the presence of Hamburger's phenomenon was noted during the paroxysmal stage, which was apparent also in the intervals, for the plasma chloride during the fever-free periods was less than in the recovered stage (i.e., ascertained as recovered by the 8-weeks-after-observation) while the chloride content of the erythrocytes was greater. Here it may be noted that the chloride content in the fever-free intervals though maintaining almost the normal figure is decidedly less than in the recovered stage. Thus, in malaria it is apparent that two factors are present, one tending to lower (acidosis?) and the other (unknown factor) tending to increase the plasma chloride. In Taihoku the chloride content of both the blood plasma and of whole blood in the healthy male adult is lower than the figures reported for other temperate regions."

MIYAHARA (Hatsuo). **Clinical Studies on Malaria. IV. On the Pulse-Rate and the Blood-Pressure.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Oct. Vol. 35. No. 10 (379). [In Japanese pp. 2255–2271. [64 refs.] English summary p. 2272.]

The pulse rate of the normal adult Chinese male in Formosa is the same as in temperate climates. During the acute stage of malaria the pulse rate was found to increase but not corresponding to the rise in temperature, possibly owing to the malaria toxin stimulating the vagus (the author suggests). After treatment, when the patient is apparently cured, some 8 weeks after the attack, the pulse remains at a higher rate than normal, owing, in part at least, to malarial anaemia.

The blood pressure [no figures are given] is, in summer, lower than in temperate zones. During the malaria paroxysm, the systolic pressure rises with rise of temperature and later falls, the first due perhaps to stimulation of the sympathetic, the second to the vagus. During the subsequent afebrile period the pressure is below normal owing, it is thought, to irritation of the vagus, together with cardiac weakness; after cure the systolic pressure returns to normal, but the diastolic remains low.

H. H. S.

TURNER (Carrol C.). **The Neurologic and Psychiatric Manifestations of Malaria.**—*Southern Med. Jl.* 1936. June. Vol. 29. No. 6. pp. 578–585. [23 refs.]

The author states that he has had personal experience of several cases of atebrian psychosis. "The earliest symptoms are mental exhilaration and insomnia, which yield only to the most drastic sedatives. This is soon followed by . . . unrest and continuous and uncontrollable verbosity . . . Agitation progresses until the patient is walking the floor almost shrieking in a peak of verbal flow. The language is coherent and is usually an elaboration of some experience of the preceding few hours or days, . . . the patient lashes out at the nearest object or at those who attempt restraint. This condition gradually merges into a somnolent delirium . . . As the patient regains consciousness, mental confusion is manifest with complete disorientation . . . This period may clear up readily in a few days, but may become chronic . . ."

W. F.

PONDÉ (Adriano). **Disturbi mentali nella malaria.** [**Mental Derangement in Malaria.**]—*Riv. di Malarologia*. Sez. I. 1936. Vol. 15. No. 4. pp. 302–306. French summary (8 lines).

Description of a case of a half-caste in Brazil suffering from dementia (amenza attonita), in whose blood were parasites of *P. falciparum*. Treatment with quinine was followed, after a prolonged stay in hospital, by sudden and complete cure.

N. W.

TIRUMURTI (Rao Bahadur T. S.) & RAO (P. Ramachandra). **Some Fatal Cases of Malaria. A Morbid Anatomical and Histological Study.**—*Jl. Indian Med. Assoc.* 1936. May. Vol. 5. No. 8. pp. 441–456. With 9 figs. [65 refs.]

The causes of severe symptoms in malaria.

The authors describe the post-mortem findings in 10 acutely fatal cases, and, in the light of these findings, they discuss the causes of the

severe manifestations of malaria. They lay particular stress on the finding, in 4 cases, of "a hyperplasia of the lymphoid tissue in some of the usual sites of aggregation of lymphoid tissue, along with a hypoplasia of the abdominal aorta," and on "the outstanding individual clinical manifestation . . . viz., hyperpnoea (respirations ranging from 32-40 per min.)." They consider that, "the occurrence of anatomical evidences of a lymphoid diathesis, such as preponderance of lymphoid tissue, vascular hypoplasia, persistence of thymus, and adrenal hypertrophy in some of the cases reported in this paper should . . . be regarded . . . as the hallmarks of a diathesis predisposing to hypersensitivity to the effects of the malarial shock." They write that, "ischaemia due to capillary constriction or occlusion, however, appears to us, to form the morbid anatomical basis of at least some of the serious malarial manifestations"; and they conclude that, "acute malaria is attended by anaphylactic phenomena, which may cause serious manifestations in sensitized individuals or in those with a lymphoid diathesis, particularly sensitive to shock." W. F.

MAGEED (Abdel Azim Abdel). A Case of *Plasmodium ovale* in Egypt.—*Jl. Egyptian Med. Assoc.* 1936. May. Vol. 19. No. 5. pp. 229-233. With 4 figs. on 2 plates.

YAO (Y. T.), LING (L. C.) & LIU (K. B.). **Studies on the So-called Changch'i. I. Changch'i in Kweichow and Kwangsi Border.**—*Chinese Med. Jl.* 1936. May. Vol. 50. No. 5. pp. 726-738. With 4 figs. & 1 map. [10 refs.]

This disease was investigated at the instance of General Chiang Kai Shek, because it had hindered the economical development and military occupation of the province of Kweichow. The disease, Changch'i, is a deadly illness which is supposed to be caused by the inhalation of poisonous gases generated in the valleys by decaying vegetation or the bodies of dead animals. Investigation by the authors showed that Changch'i is subtertian malaria. W. F.

TIRUMURTI (T. S.) & RADHAKRISHNA RAO (M. V.). **The Rôle of Malaria in the Causation of Cirrhosis of the Liver.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 149-152. With 4 figs. on 2 plates. [12 refs.]

In India malaria is not uncommonly associated with cirrhosis of the liver. In this communication the authors describe the results of the histological examination of a series of "chronic malarial livers." In none of the cases investigated was there any pseudo-lobulation or fibrosis similar to that seen in a typical case of cirrhosis of the liver. Kupffer cells were loaded with malaria pigment. The authors arrive at the conclusion that malaria *per se* is not a direct cause of cirrhosis of the liver. N. W.

DAVIES (J. Rodyn). Unusual or Obscure Case. Benign Tertian Malaria associated with Urticaria.—*East African Med. Jl.* 1936. Aug. Vol. 13. No. 5. pp. 146-147.

GANGULI (P.) & BHATTACHARYA (P. B.). A Case of Malaria complicated with Erythematous Rash.—*Indian Med. Gaz.* 1936. Sept. Vol. 71. No. 9. p. 530.

MEYER (Richard). Steinbildung in der Milz nach Malaria als Krankheitsursache. (Bericht ueber einen Fall.)—*Wien. Klin. Woch.* 1936. Dec. 4. Vol. 49. No. 49. pp. 1496–1498. With 4 figs.

RUGE (Heinrich). Zur Frage der James'schen Sporozoitentheorie. [**James's Sporozoite Theory.**].—*Ztschr. f. Hyg. u. Infektionskr.* 1936. Sept. 15. Vol. 118. No. 6. pp. 724–737. With 5 figs.

The author concludes, from his careful observations on 33 patients infected with malarial blood, that he has obtained indirect support for James's views, namely, the penetration of the sporozoites into the reticulo-endothelial tissue, the change of the sporozoites into other forms (merozoites?) and only thereafter they attack the red cells. Further, the hypothesis is supported by the fact that the incubation period of benign tertian malaria is uninfluenced by an increase of the number of parasites introduced. Also in two cases, in which the reticulo-endothelial system was heavily infected with sporozoites, numerous relapses occurred in spite of complete treatment on the usual lines, even although the dose of the drug was considerably increased at the first relapse. Also the results of treatment with the new drugs, atebrian and plasmoquine, support the sporozoite theory, and indicate that both these drugs have a sporozoiticidal action.

E. D. W. Greig.

JOLLY (A. M. D.). Aspects atypiques du *Plasmodium falciparum* chez les enfants indigènes en bas âge à Brazzaville (A.E.F.). Fréquence de l'évolution schizogonique et gamétogonique complète dans le sang périphérique. [**Frequency of all Developmental Forms of Schizonts and Gametocytes of *Plasmodium falciparum* in the Circulating Blood of Young Native Children in Brazzaville.**].—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 4. pp. 229–239. With 1 chart & 1 plate.

In Brazzaville one frequently sees young native children (below the age of 4 to 5 years) suffering from malaria in whose blood all developmental forms of schizonts and gametocytes of *P. falciparum* can be found. Such a phenomenon is never seen in older children or native adults, who have for the most part developed a high degree of tolerance. It is never seen in European children, who have almost always been treated with quinine. These unusual cases are very severe and, if untreated, are attended with a considerable mortality. Many of them have a degree of splenic enlargement that is unusual in malignant tertian infections. Parasites are very numerous during the febrile attack and relatively numerous during periods of apyrexia, as are large mononuclear cells containing melanin. All this indicates a very low degree of resistance. All these cases were observed during the hyperendemic season, October to mid-December, which is synchronous with the beginning of the rainy season.

The forms of parasite seen are described in detail and well illustrated. The red cells were uniformly normal in size and shape: there were no Schüffner's dots. The typical fine ring forms, without pigment, were characteristic. Numerous amoeboid forms were seen, including all stages up to the formation of gametocytes. Certain of these forms might on superficial examination be mistaken for *P. malariae*. Rosettes

with many merozoites, generally as many as 30, irregularly placed, were noted, with variable arrangement of pigment. Intrajobular forms of gametocytes were often found, including unusual developing forms, which the author names "plastic gametocytes." In short, all developing forms such as may be found in culture by Bass's method were found in the peripheral blood. The conditions in which crescents develop and their morphology gives one to believe that they are true resistant forms of the parasite: they replace plastic gametocytes when conditions for the parasite become unfavourable, owing to increased resistance of the host or drug treatment for example.

These unusual forms of malaria, and the abnormal forms of parasite which characterize them, are remarkably amenable to treatment with quinine; in subsequent febrile attacks only the usual ring forms and crescents are found.

N. W.

DE MEILLON (Botha). **Nuclear Division in Sporozoites of *Plasmodium*.**—*South African Med. Jl.* 1936. July 11. Vol. 10. No. 13. p. 474. With 1 fig.

Routine dissection of mosquitoes is done by the author in distilled water. This causes the sporozoites to swell up and thus become more readily identified. Not all sporozoites behave in this manner. Unswollen sporozoites in an *A. funestus* were seen to contain several chromatin masses throughout their length except at the extreme ends. Nuclear division in sporozoites has previously been observed by KNOWLES and BASU, and by MISSIROLI. de Meillon suggests that such nuclear division may be necessary for successful infection of the human host.

N. W.

BARBER (M. A.). **Degeneration of Sporozoites of the Malaria Parasite in Anopheline Mosquitoes in Nature and its Relation to the Transmission of Malaria.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 45-56. With 1 plate.

Degeneration of sporozoites in the salivary glands has been frequently observed in anophelines infected in the laboratory but much less frequently in naturally infected mosquitoes. Particular interest attaches therefore to this report describing observations in Greek Macedonia and in Cyprus, where this phenomenon is remarkably common. All degrees of degeneration were noted, but for purposes of description the author has classified sporozoites as "(a) normal, (b) abnormally thickened, and (c) wholly degenerate or with a considerable proportion of degenerate sporozoites intermingled."

During the last four years 515 sporozoite positive anophelines have been found in Macedonia: 343 *elutus*, 164 *superpictus* and 8 *maculipennis*. The frequency of sporozoite degeneration is shown in Table I which is reproduced:—

Species	Number examined	Percent. with normal sporozoites	Percent. with thickened sporozoites	Percent. with degenerate sporozoites
<i>Elutus</i> ...	343	45.8	20.4	33.8
<i>Superpictus</i> ...	164	14.6	43.3	42.1

Degeneration of *elutus* sporozoites was much less common in summer and autumn than in winter. In *superpictus*, however, only 9.5 per cent. of 105 dissected during the summer months had normal sporozoites.

In Cyprus, in July, of 72 infected *superpictus* 11 per cent. had normal sporozoites: in 57 per cent. sporozoites were thickened and in 32 per cent. they were degenerated.

In a series of laboratory experiments it was found that degeneration may occur among quite young sporozoites, at summer temperature; such degeneration was found with *P. vivax* in *superpictus* and *maculipennis*, and with *P. falciparum* in *superpictus*, *maculipennis* and *elutus*.

A localization of sporozoites of one degree of degeneration was often observed in a salivary gland or in a lobe of a gland. In the other gland, or in another lobe, sporozoites either normal or in a different stage of degeneration might be found.

Epidemiological studies in Macedonia and in Cyprus have led the author to believe that degeneration of sporozoites may help to explain the relative inability of *superpictus* to transmit malaria; this relative inability is especially marked in Macedonia.

N. W.

SOBKY (M.). **Effect of Anti-Malaria Drugs on Malaria Parasites. (Preliminary Note).**—*Jl. Egyptian Med. Assoc.* 1936. May. Vol. 19. No. 5. pp. 234-243.

The author counted the parasites in the blood of his patients, gave them a single dose of an antimalaria drug and, after an interval of 3 or 4 hours, he counted the parasites again. On an average there were more parasites after the drug than before. The drugs used were: quinine 5 grains; quinine 10 grains; quinine 15 grains; plasmoquine 0.02 gram; atebirin 0.1 gram.

W. F.

BARBER (M. A.). **The Time Required for the Examination of Thick Blood Films in Malaria Studies, and the Use of Polychromatophilia as an Index of Anemia.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 25-31.

The author summarizes some of the results of his large experience in routine blood examinations in malaria surveys. It is emphasized that no single examination, however thorough, can do more than reveal a proportion of the parasite carriers. The blood of 65 children was examined on three occasions in November and December when there was no transmission of malaria. A minimum of 66.2 per cent. of these children were infected but in only 36.9 per cent. were parasites found on all three occasions.

For the author the examination of 100 fields of a thick blood film (1/12 oil immersion and 7× ocular) is sufficient for all practical purposes: this requires approximately two minutes. The importance of having properly prepared blood films is emphasized and a technique for preparing thick and thin films is described.

In dried, unfixed, thick-films, simultaneously stained and dehaemoglobinized in diluted Giemsa stain, abnormal erythrocytes are distinguishable as blue clouds. The degree of polychromatophilia or basophilia thus revealed is used by the author as a rough measure of anaemia. Four grades are distinguished according to the number of

clouds per thick-film field. Such a measure is found to accord remarkably with the degree of anaemia as revealed by the Dare haemoglobinometer. The spleen index tends to lag when the parasite index rises or falls; the microscopic anaemia index is more sensitive to such changes, and should be a useful adjunct to malaria surveys. *N. W.*

WRIGHT (H. B.). **Notes on Henry's Melano-Flocculation Test as an Aid to the Early Diagnosis of Malaria.**—*Jl. Roy. Army Med. Corps.* 1936. Oct. Vol. 67. No. 4. pp. 264–266.

The author concludes that, though Henry's reaction is not very often positive in the early stages of malaria, the consistently negative results obtained in non-malarial fevers makes it well worth carrying out in early cases of fever in which no parasites can be found. *N. W.*

HENRY (A.). Mélanoflocculation et expertise des pensionnés.—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 493–496.


CIUCA (M.), BALLIF (L.), CHELARESCU (M.) & LAVRINENKO (M.). Contributions à l'étude de l'action dévitalisante d'une dose unique de plasmoquine de 0,02 ctgr. sur les gamétocytes de la tierce maligne. [**The Devitalizing Effect of a Single Dose of 0.02 Gram of Plasmoquine upon the Gametocytes of Subtertian Malaria.**]—*Arch. Roumaines Path. Expér. et Microbiol.* Paris. 1935. Dec. Vol. 8. No. 4. pp. 471–489.

This dose is effective within 48 hours in most cases, but not in all, and, in practice, the dose should be given twice weekly.

Twenty-six cases, comprising 14 of natural infection, 5 experimentally infected by mosquitoes, and 7 cases of blood-inoculated infection were given a single dose of 0.02 gm. plasmoquine. The gametocytes were counted, the number of exflagellations was counted (following the technique of James and Schute) and mosquitoes were fed on the patients. These procedures were carried out 4 hours before inoculation with plasmoquine, 4 hours after, and daily thereafter for 15 days. Dissections of mosquitoes were made from the 3rd to the 10th day after feeding.

The results were as follows:—The blood of all patients was still infective for mosquitoes 4 hours after the administration of 0.02 gram plasmoquine. After 24 hours, 12 cases infected mosquitoes. After 48 hours, 4 cases. After the 3rd day only one case remained infective. The number of gametocytes increased during the first 24 hours after the administration of the plasmoquine and then decreased. In 15 of the 26 cases gametocytes were present up to the 9th day. In 12 cases there were as many as 40 or 50 exflagellating gametocytes per cubic millimetre, although the blood was no longer infective for mosquitoes. The authors conclude that 0.02 gram plasmoquine exerts a gametocidal effect in most cases within 48 hours, but in the field it is best to give a dose twice a week. *W. F.*

DIKSHIT (B. B.). **Pharmacological Action of Plasmoquine.**—*Records of the Malaria Survey of India.* 1936. Sept. Vol. 6. No. 3. pp. 453–466. With 5 figs. & 1 graph. [14 refs.]

"(1) Tests on protozoa and bacteria show that plasmoquine is not very toxic to these. Toxicity tests were also made in cats, dogs, rabbits, guinea-pigs and leeches. 

" (2) Plasmoquine has no antipyretic action of its own. In combination with quinine, however, it produces a quicker action than quinine alone.

" (3) Plasmoquine reduces the blood pressure by acting directly on the heart and also by its action on the vasomotor centre.

" (4) It depresses the respiration and constricts the bronchioles to a slight degree.

" (5) The movements of the gastro-intestinal tract are inhibited. Plasmoquine produces a fatty degeneration of the liver cells when given in toxic doses.

" (6) There is evidence of general depression of the central nervous system and a moderate stimulant action on the uterus."

MIETZSCH (F.), MAUSS (H.) & HECHT (G.). **Experimental Studies on Atebrin.**—*Indian Med. Gaz.* 1936. Sept. Vol. 71. No. 9. pp. 521–524. With 2 curves.

Atebrin in watery solution decomposes by hydrolysis ; this process is accelerated by heat. The aliphatic component remains in solution. The cyclical component, 2-methoxy-6-chloracridone, is precipitated as a light yellow crystalline powder. Neither of these two end products is as toxic as atebrin itself, but it is advisable to inject watery solutions of atebrin as soon as possible after they have been prepared. By mouth watery solutions should not be given later than 12 hours after their preparation : the full degree of their activity cannot be depended on if kept longer than this. N. W.

HECHT (Gerhard). Die Verteilung des Atebrins im Organismus. [**Distribution of Atebrin in the Body.**]—*Arch. f. Experim. Path. u. Pharm.* 1936. Oct. 20. Vol. 183. No. 1. pp. 87–105. [12 refs.]

The author considers that the unsatisfactory state of our knowledge of the distribution of atebrin in the body is due to the want of a method for its quantitative estimation in the organs. He tried the method of CHOPRA and ROY (this *Bulletin*, 1936, Vol. 33, p. 273) but had to abandon it as it did not enable him to recover quantitatively from the blood of various animals the added atebrin. So he elaborated his own method, which he describes. Using his method he found that the liver, lungs, kidneys and spleen in this order took up the atebrin strongly, then follow the stomach and intestines, heart, pancreas and genital organs. The muscles, skin and central nervous system take it up very slightly. Atebrin is taken up by the organs which it meets first, thus in the case of intravenous administration the lungs, but the liver in oral administration. The lungs retain the atebrin longest. Atebrin passes rapidly from the blood into the organs. In intramuscular administration the level of atebrin in the blood after an hour can be quite definitely determined, whilst in oral administration the level is barely determinable then. All the experimental work was done in animals, rabbits and cats.

He states that KEHAR (this *Bulletin*, 1936, Vol. 33, p. 796), who wrote to him regarding a much over-stretched theory of the circulation of atebrin by the liver-bile-intestine-liver, is obviously not familiar with his work. He emphasizes that he has recorded exclusively experimental findings. E. D. W. Greig.

SEELIG (S. F.) & SINGH (Wadhawa). **A Clinical Study of the Effects of treating Malaria with Atebrin and Atebrin Musonate.**—*Records of the Malaria Survey of India*. 1936. June. Vol. 6 No. 2. pp. 171–175. With 25 charts.

This is an account of the treatment of 25 Sikh soldiers suffering from malaria, of whom 11 were infected with *P. vivax*, 13 with *P. falciparum* and one with *P. malariae*. Eight of them received a subcutaneous injection of 0.75 mgm. adrenaline followed half an hour later by an intramuscular injection of 0.375 gm. atebrin musonate. Twenty-four hours later a five-day course of atebrin tablets was commenced, 0.1 gm. three times a day.

There was no fever after the commencement of treatment and the parasites disappeared.

Seven cases received the adrenaline and atebrin musonate injections as above but no subsequent treatment. Fever returned and parasites persisted in five of these cases.

Eight patients received each two intramuscular injections of atebrin musonate, 0.375 gm., at an interval of 24 hours. In one case only did the fever return and the parasites persist.

Temperature charts and treatment notes of each patient are reproduced. The authors conclude that the combined atebrin musonate and atebrin treatment, as carried out with the first group of patients, is the best for the rapid restoration of fitness for military duty of the patients under their charge.

N. W.

VAN HEUKELOM (A. Siegenbeek) & OVERBEEK (J. G.). **Behandeling van de acute malaria-aanval met atebrine pro injectie.** [**Treatment of Acute Malaria with Atebrin Injections.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Oct. 6. Vol. 76. No. 40. pp. 2507–2529. With 1 fig. & 2 charts. [31 refs.] English summary.

During the nine months, August 1935–May 1936, 119 cases of acute malaria were treated by intramuscular injections of atebrin. One hundred of these, 62 subtertian, 16 benign tertian, 5 quartan and 17 mixed infections, are compared with a similar series treated at the same hospital with quinine given orally in the usual way. Those receiving the atebrin (in doses of 0.3 gm.) lost the fever in 48 hours in 87 per cent., those given quinine in 77 per cent. With so few cases the difference has no statistical significance. No cases of poisoning were observed; two patients had epileptiform attacks and both died, but at autopsy cerebral disease was found to account for this. Yellow discoloration of the skin was seen on two occasions. The atebrin had no effect on gametocytes of *P. falciparum*. A satisfactory follow-up treatment is yet to be determined; the atebrin, 2 doses of 0.3 gm. intramuscularly, did not prevent relapses.

H. H. S.

BERCOVITZ (Nathaniel). **The Use of Atebrin-Musonat for Malaria in Hainan, China.**—*Chinese Med. Jl.* 1936. May. Vol. 50. No. 5. pp. 687–692.

Details are given of 25 cases treated with two injections of atebrin musonate (each of 0.3 gram), subcutaneously or intramuscularly, with a 24-hour interval between them. Some of the patients were very ill with malaria, three were pregnant, two were children 8 and 12 years old,

none was younger. No toxic symptoms followed the injections. The therapeutic results were excellent. "The use of quinine with plasmoquine following the 2 injections of Atebrin-Musonat does much to bring back the general tone of the patient, as well as taking care of any stray parasites not killed by the injections." W. F.

KANG (T.) & GARVIS (B. W.). **Maniacal Symptoms following Use of Atebrin. Report of a Case.**—*Chinese Med. Jl.* 1936. July. Vol. 50. No. 7. pp. 976-978.

A young intelligent adult male, with no personal or family history of mental or nervous trouble, developed maniacal symptoms two days after the completion of a five-day course of treatment with atebrin. The total amount of atebrin taken was 1.5 grams. The symptoms lasted about eight days. N. W.

EJERCITO (Antonio). Present Concept of the Therapeusis of Malaria.—*Jl. Philippine Islands Med. Assoc.* 1936. Apr. Vol. 16. No. 4. pp. 207-220. [32 refs.]

BHATTACHARYYA (Rasamay). Observations on the Relative Value of Atebrin and Quinine as Therapeutic Agents in Malaria.—*Indian Med. Gaz.* 1936. July. Vol. 71. No. 7. pp. 375-376.

FLACK (Hugh), MAJUMDER (D. C.) & GOLDSMITH (K.). Atebrin by Injection vs. Quinine in a Tea-Garden Practice.—*Indian Med. Gaz.* 1936. July. Vol. 71. No. 7. pp. 373-375.

NAEGELSBACH (E.). **Solvochin for Intravenous and Intramuscular Injection in Malaria.**—*South African Med. Jl.* 1936. June 13. Vol. 10. No. 11. p. 408.

The author calls attention to the value of Solvochin in the treatment of malaria whenever intramuscular or intravenous medication is indicated; his recommendation is based on eight years' experience. Solvochin is said to contain quinine in weakly alkaline solution. Intramuscular injections are free from the pain which the usually employed quinine preparations commonly cause. For intramuscular injections one ampoule is given twice a day; this is equivalent to a daily dose of 15 grains of quinine hydrochloride. For children a diminished dose is given, according to weight. For intravenous injection one ampoule is diluted with 6 to 8 cc. of boiled water. [Solvochin is manufactured by the Chemisch-Pharmazeutische Aktien-Gesellschaft, Bad Homburg.] N. W.

MEZINCESCO (D.) & CORNELSON (D. A.) with the collaboration of C. LAZAR & L. BUŞILA. Sur l'efficacité de l'atébrine et de la quinine dans le traitement prophylactique du paludisme. [**The Prophylactic Treatment of Malaria with Atebrin and with Quinine.**]—*Arch. Roumaines Path. Expér. et Microbiol.* Paris. 1935. Dec. Vol. 8. No. 4. pp. 449-470. With 3 maps, 1 fig. & 1 graph.

The drugs acted equally well, but there were many relapses in the spring. Skin staining is a disadvantage in atebrin prophylaxis.

Half the inhabitants (132) of a Rumanian village received prophylactic treatment with atebrin and the other half with quinine. This

treatment was begun at the beginning of the malaria season in July, and was continued until the beginning of December. All those who were found with parasites in their blood at the beginning of the prophylactic treatment, or at the monthly blood examination, were given a course of curative treatment. A month after the beginning of the experiment, there were very few parasite carriers in either group, and at the beginning of December there were practically none. This freedom from parasites was maintained throughout the winter after the prophylactic treatment had been suspended, but in the spring, the parasitic index rose to 23.1 per cent. in the atebtrin group and to 18.5 in the quinine group. The authors concluded that :—(a) Atebrin and quinine, in the doses given, were of equal value as prophylactics. (b) Eradication could not be effected by these means. (c) Transmission occurred during the prophylactic treatment, the infections remaining latent until the following spring. The doses given for prophylactic treatment were :—in one group, atebtrin 0.15 gram every other day ; in the other group 0.4 gram quinine daily. The curative treatment consisted, in the atebtrin group, of 0.15 gram of atebtrin daily for 12 days, with an interval of one day after the sixth day, and, in the quinine group, of 1 gram of quinine daily, for 36 days in 1933 and for 12 days in 1934, with an interval of one day after every sixth day. There were certain drawbacks to the use of atebtrin ; by the time 5 doses had been given yellow staining was present in 12 per cent. ; when 14 doses had been given it was present in 82 per cent., and in 6 per cent. it lasted more than 5 months after the suspension of the prophylactic treatment. Vomiting made it necessary to stop treatment in three children under 4 years of age. One adult suffered from severe headache and another from diarrhoea ; atebtrin had no bad effect on pregnant women.

W. F.

ROSA (Alberto) & MACCOLINI (Roberto). Il trattamento preventivo con : Atebrin-Plasmoquina nella profilassi della malaria. [**Atebrin-Plasmoquine in the Prevention of Malaria.**].—*Giorn. Ital. di Malat. Esot. e Trop.* 1936. July 31. Vol. 9. No. 7. pp. 133–136.

The investigations described in this paper were designed to determine the value of a combination of atebtrin and plasmoquine in the prevention of malaria. The first series of observations relate to ten cases submitted to the bites of infected anophelines, *A. maculipennis* var. *atroparvus*. In seven cases *P. vivax* was employed, in three *P. falciparum*. Treatment, consisting of the administration of one tablet containing atebtrin 0.10 gm. and plasmoquine 0.005 gm. twice a day on two successive days in three successive weeks, was sufficient to prevent any febrile attack in persons submitted, within a day or two of the commencement of treatment, to the bites of numerous infected mosquitoes. The patients were kept under observation for periods of from four to seven months.

The second half of the paper deals with a field experiment carried out at Goro with a population of about 2,500. Here malaria is endemic. From the 27th of July to the 27th of November a group of persons were submitted to treatment as follows :—

Age.	Monday.	Wednesday.	Saturday.
4 to 7	atebrin 0.10	plasmoquine 0.01	atebrin 0.10
8 to 15	0.15	0.015	0.15
16 and over	0.20	0.02	0.20

Fifty-seven persons commenced the treatment of whom 36 continued it to the end: only two of these contracted malaria. Taking only the 36 into account the morbidity rate of the group was 5.5 per cent. The malaria morbidity rate of the whole population during the same period amounted to 17.2 per cent.

N. W.

EARLE (Walter C.) & PEREZ (Manuel). **The Role of Gametocyte Carriers in the Failure of Chemotherapy as a Malaria Control Measure.**—*Bol. Asoc. Med. de Puerto Rico*. 1936. Aug. Vol. 28. No. 8. pp. 167-170.

With the object of explaining some of the difficulties attendant upon attempts to control malaria by treatment of the human carrier a study was made of the conditions under which gametocytes appear in the blood stream. For three years from 30 to 40 children in an endemic centre on the coast of Porto Rico were kept under continuous observation, the malaria parasites being counted once a week, or more frequently when fever was present or when numerous gametocytes were found. The authors conclude that there is no way of predicting the presence of gametocytes in the blood stream. It is obviously impossible to examine blood smears from the general population at frequent intervals to identify carriers. The control of malaria by an attack on the carrier is restricted to groups of people under control, and even here it would probably be necessary to administer a drug to the entire group at regular intervals.

N. W.

DECOURT (Ph.), MARINI (Ch.) & HENRY (Ch.). Expériences sur la prophylaxie collective du paludisme réalisées à Menzel-Temime (Cap Bon Tunisien) en 1935.—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 480-486.

WU (L. Y.). **A Study of Anopheline Larvae of Kwangtung Province, with Notes on their Relation to the Incidence of Malaria.**—*Lingnan Sci. Jl.* Continuation of *Lingnaam Agric. Rev.* 1936. Vol. 15. Nos. 1 & 2. pp. 1-10; 265-273. With 3 plates & 1 fig. [35 refs.]

The author's summary gives a good account of the contents of this article, the first part of which is purely systematic.

"The present study of anopheline larvae and their relation to the incidence of malaria covers two areas in Kwangtung Province, namely, Swatow and Canton, the field work covering two years, 1931 to 1933. Fragmentary data for 1934 and 1935 are also included.

"An historical review shows that although in the last ten years some work of this kind has been done in North, yet in the South, not including Hong Kong, only fragmentary data have been gathered.

"The following species of anopheline larvae were found during the present study: *A. hyrcanus* var. *sinensis*, *A. tessellatus*, *A. minimus*, *A. maculatus*, *A. jeyporiensis* var. *candidiensis*, and *A. splendidus*. Notes on their breeding habits and a table for the important diagnostic characters of the fourth instar larvae are given. A key to the anopheline larvae reported for Kwangtung Province is also given.

"An examination of the relationship between the abundance of the different species of anopheline larvae and environmental factors, such as humidity, temperature, and rainfall, was made. The result of such a correlation was then compared with the incidence of malaria in the localities studied. It was found that rainfall and temperature have great effect

on the abundance of anopheline mosquitoes. *A. minimus* is the natural carrier in the hilly region, while *A. hyrcanus* var. *sinensis* may be responsible for malaria on the plain, and *A. maculatus* appears to be also responsible for malaria in the former. The evidence for *A. tessellatus* as a carrier of malaria is less convincing. For the two remaining species, *A. splendidus* and *A. jeyporiensis* var. *candidiensis*, the present data are too scanty to warrant any definite conclusion." H. H. S.

STRICKLAND (C.) & ROY (D. N.). **The Prevalence and Habits of Anophelines in Relation to Physical Conditions. With a Statistical Analysis** by H. P. CHOWDHURI.—*Riv. di Malarologia*. Sez. I. 1936. Vol. 15. No. 3. pp. 171–186. With 2 charts.

The paper records observations made throughout twelve months in Calcutta. The specimens were caught in selected places at regular intervals; experiments upon the factors which may be supposed to influence the length of life of *Anopheles* were also performed.

In the course of twelve months 8,564 anophelines were taken, 90 per cent. of them being *A. rossi* or *vagus*. Only 273 *A. stephensi*, the species which is presumably responsible for the malaria, were caught during this period. The figures were analysed statistically [perhaps more elaborately than the total numbers warrant]; significant positive correlations were found with rainfall and absolute humidity, for the period four weeks previous to capture. P. A. Buxton.

COLLIGNON (E.) & AMBIALET (R.). **Activité des anophèles et humidité atmosphérique sur le littoral algérien. [Atmospheric Humidity and Anopheline Activity on the Algerian Coast.]**—*Arch. Inst. Pasteur d'Algérie*. 1936. June. Vol. 14. No. 2. pp. 119–122. With 1 chart.

The observations described were carried out at Taher, situated on raised ground a few miles from the sea on the coast of Algeria. *Anopheles maculipennis* is the preponderating species: estimations of its prevalence were made by means of mosquito traps placed outside the village. In Taher itself captures are negligible, successful anti-larval measures being carried out.

A. maculipennis is most in evidence from May to July. In July there is a rapid diminution in the numbers caught and captures remain insignificant until well on in September. This period of diminished prevalence is characterized by violent fluctuations in the relative atmospheric humidity, occasioned by an alternation of land and sea winds. Temperature remains reasonably constant throughout the period. The authors ascribe the disappearance of anophelines from their usual diurnal resting places to these abrupt falls in the relative humidity. N. W.

LAMPRELL (B. A.). **A Discussion on the Infectivity Surveys and Feeding Habits of Anopheline Mosquitoes in the Oriental Region, with Special Reference to Assam and Northern Bengal.**—*Records of the Malaria Survey of India*. 1936. June. Vol. 6. No. 2. pp. 213–231. [20 refs.]

The subject of this admirable though not readily compressible paper is concisely expressed as "the importance of different species as vectors of malaria in Assam and in other localities in the Oriental region."

As to the factors whereon such "importance" depends, the following enumeration is worth quoting, if only as an example of, and incentive to clear thinking.

"1. The average gametocyte rate of the community under consideration.

"2. The density of the carrier species that may be found amongst that community.

"3. The proportion of each of these species that will bite man at any blood feed and so be liable to ingest gametocytes, or inject sporozoites.

"4. The proportion in each species of those that bite man in which ingested gametocytes will develop into sporozoites.

"5. The proportion of those in which sporozoites have developed that will once more feed on man whilst the salivary gland is infected.

"For the practical malariologist the factor of ultimate importance is the actual numerical prevalence of mosquitoes with salivary gland infection that at any period are feeding on the blood of the community in which he is trying to apply anti-mosquito methods to control malaria."

Comparison is made between the blood feeding habits of certain anophelines in the tea areas of Assam and Northern Bengal, as determined by workers associated with the Ross Institute of Tropical Hygiene, and similar observations on the same species recorded elsewhere in the Oriental Region. Tables are given showing the "results of 106,272 dissections of anopheline mosquitoes in Assam and Northern Bengal," and these "are compared with the infectivity findings of the Assam Medical Research Society."

Inter alia, the author insists upon the importance of determining the relative density of species in every community, *i.e.* "the relative number of female adults of each species which visits the community under consideration for the purpose of taking a blood meal." Data under this heading combined with others as to salivary gland infection, are furnished in Table IV for nine species of *Anopheles*, as regards four centres in Assam and the whole province. It would appear that "considering Assam as a whole, *A. minimus* is more frequently infected than all other species, and is in great preponderance in Mangaldai." Locally, however, in Assam, *A. minimus* would seem to be replaced by one of the other species, and before estimating the relative importance of each of those mentioned "the androphilic factor must be taken into account." Even *A. philippinensis*, though not yet found in Assam with infected salivary glands, may still, owing to its local abundance, prove to be "a vector of importance in some communities." In order to determine "the 'receptivity index' of each species to plasmodial infection," there should be "mass experimental feeding of batches of laboratory-hatched mosquitoes on malarious communities." Other matters whereon further research is desirable are "the longevity of species under natural conditions in different areas," and "the average number of blood meals ingested."

E. E. Austen.

RUSSELL (Paul F.) & BAISAS (Francisco E.). **A Practical Illustrated Key to Adults of Philippine Anopheles.**—*Philippine Jl. Sci.* 1936. Jan. Vol. 59. No. 1. pp. 15-64. With 6 figs. & 34 plates (7 coloured). [19 refs.]

Having already (1934) dealt similarly with the *larvae* of Philippine *Anopheles* [see this *Bulletin*, 1935, Vol. 32, p. 803], the authors now

carry their useful labours one stage further, with the proviso that the present key "is subject to revision, as there remains a considerable amount of systematic study to be done, especially on eggs and pupae." As a concession to possible lack of technical skill on the part of "the average field worker," the key so far as possible is based on characters other than male terminalia. It is further explained that in certain cases (*A. insulaeflorum*, *A. baezai*), in default of specimens from typical localities, names are used provisionally.

In addition to the key, detailed descriptions of twenty-five named and two unnamed species are given. The paper is very fully illustrated with original black and white figures of details, while the coloured plates are devoted to *A. minimus* var. *flavirostris* (whole insect), the wings of twenty-seven and the abdomens of five species. E. E. A.

STRICKLAND (C.) & GUPTA (S. C. Sen.) **The Seasonal Infectivity of Mosquitoes as determined by a Study of the Incidence of Infantile Malaria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 245-250.

If, for any given locality, it is possible to obtain a record of all infants born during the course of a year, with the date of birth of each child and the date of its first attack of malaria, the study of such material is of value in determining seasonal liability to malaria infection. The authors describe the application of this method on a tea estate where all mothers and infants are kept under observation. N. W.

MORISHITA (Kaoru). **On the Anophelines of *aitkeni*-Group in Formosa.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Mar. Vol. 35. No. 3 (372). [In Japanese pp. 583-590. [11 refs.] English summary p. 590.]

A. aitkeni var. *bengalensis*, Puri, and *A. insulaeflorum*, Swellengrebel, have been found in Formosa. They are rare and it is improbable that they are concerned in spreading malaria. W. F.

MORISHITA (Kaoru). Further Notes on the Anopheline Mosquitoes in Formosa.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Apr. Vol. 35. No. 4 (373). [In Japanese pp. 888-895. English summary pp. 896-897.]

PURI (I. M.). The Distribution of Anopheline Mosquitoes in India: Additional Records, 1931-1935.—*Records of the Malaria Survey of India*. 1936. June. Vol. 6. No. 2. pp. 177-211. [87 refs.]

KLIGLER (I. J.) & MER (G.). Anopheles in Syria and their Distribution.—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 3. pp. 217-221.

GASCHEN (H.) & RAYNAL (J.). Recherches sur les affinités trophiques des anophèles d'Indochine (première note). *Anopheles hyrcanus* var. *sinensis*. [The Feeding Preferences of the Anophelines of Indo-China.]—*Ann. Inst. Pasteur*. 1936. Sept. Vol. 57. No. 3. pp. 311-324. With 3 graphs.

This is the first instalment of a report on the relationship between the maxillary dentition of the anophelines of northern Indo-China and their anthropophilism or zoophilism as the case may be: it is concerned solely with *A. sinensis*.

In 1933, ROUBAUD, TOUMANOFF and GASCHEN, studying the *Anopheles* of Tonking, found *sinensis* and *vagus* to be multidentate, and *minimus*, *aconitus*, *jeyporiensis* and *maculatus* paucidentate. The two former play a negligible rôle in the spread of malaria; the four paucidentate species are all important vectors. Paucidentation and anthrophilism appear to be closely related. The mean maxillary index of 286 *A. sinensis* examined by Roubaud and his colleagues was 15·17. During the investigations under report 1,096 *sinensis* were found to have a mean maxillary index of 15·14. No less than 92 per cent. had an index of 14 or over. Of the total engorged *sinensis* caught in stables and examined 86 per cent. had fed on animal blood; in houses 69·7 per cent. In the latter case the stomachs of only 8·8 per cent. contained human blood. In a considerable proportion the nature of the blood could not be identified. The nature of the stomach contents was determined by the precipitin test. The zoophilism of *sinensis* in northern Indo-China is thus very marked. This was found to be the case in all places in which the inquiry was carried out, though the animal serving as host varies somewhat from place to place. Sometimes the horse is the important source of food supply, elsewhere pigs. In rural areas, however, cattle, more especially buffaloes, are of chief importance; where these are numerous the zoophilism of *sinensis* is all but complete.

N. W.

HU (Stephen M. K.) & YU (H.). **Preliminary Studies of the Blood Preferences of *Anopheles hyrcanus* var. *sinensis* Wiedemann in Shanghai Region.**—*Chinese Med. Jl.* 1936. Feb. Supp. No. 1. pp. 379–386. [16 refs.]

The carrier in Shanghai is *A. hyrcanus*. Specimens were caught in a cowshed, starved for 8 days until the blood had disappeared, and then 700 were released into a room which was occupied by a man and a number of animals. On the following morning the mosquitoes were caught and the contents of their stomachs were squeezed out on to filter paper for the precipitin test. The percentage results were as follows:—man 4·8, cow 47·6, goat 25·0, pig 13·8, cat 3·4, dog 3·6, chicken 1·8.

W. F.

TAGLIABUE (C.) & PERILLI (R.). **Ricerche sperimentali sulle diverse razze di *Anopheles maculipennis* e sulle preferenze alimentari degli anofeli in Provincia di Milano. [Varieties of *A. maculipennis* in the Milan Province and their Feeding Predilections.]**—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 3. pp. 207–216. [12 refs.] French summary.

The Province of Milan is a region of intense infestation with anophelines but has a low malaria infection rate. The abundance of anophelines is explained by the abundance of irrigated rice fields. Malaria was very widespread at the beginning of the century but at present it is responsible for a morbidity rate of from 5 to 10 per cent. in certain limited areas; in other areas it is completely absent in spite of the ubiquitous mosquito.

The predominant variety of *A. maculipennis* is *messeae*—70·6 per cent. in the areas with malaria, 92 per cent. in the malaria-free areas. Serum precipitation tests showed that in the malaria-free areas 79·5 per cent. of the anophelines had fed on domestic animals, cattle, pigs or horses,

and only 20.5 per cent. on human beings. In the regions with malaria these figures were 43.6 and 56.4 per cent., respectively. The numbers of domestic animals are considerable :—80 cattle, 31 pigs and 20 horses per square kilometre.

The authors appear to be justified in their conclusion that the predilection of the local anophelines for animal blood may well explain the diminished prevalence of malaria that has characterized recent years.

N. W.

ZOTTA (G.). Races d'*Anopheles maculipennis* en Yougoslavie. (Note préliminaire sur les recherches faites en Yougoslavie pendant l'été de 1934.) [**Races of *Anopheles maculipennis* in Yugoslavia. (Investigations made in Yugoslavia during the Summer of 1934.)**]—*Arch. Roumaines Path. Expér. et Microbiol.* Paris. 1935. Dec. Vol. 8. No. 4. pp. 427–447. With 1 folding map.

In Yugoslavia the following species are found :—*Anopheles maculipennis*, *A. elutus*, *A. pseudopictus*, *A. superpictus*, *A. claviger* (*A. bifurcatus*), *A. plumbeus* and *A. algeriensis*. In central and southern Dalmatia, Montenegro and the greater part of Macedonia, *A. superpictus* is the dominant species. It plays a considerable part in the maintenance of endemic malaria, and since it appears later in the season than *A. maculipennis* the disease exhibits a double annual peak. The author's studies of races of *A. maculipennis* were based on egg-characters, and an analysis of 2,498 egg-batches yielded the following results :—*A. m. typicus*, 1,369 ; *A. m. messeae*, 886 ; *A. m. atroparvus*, 1 ; *A. m. labranchiae*, 107 ; *A. elutus*, 135. The numerical distribution of these forms in the different regions studied is shown in a table.

In Croatia, *typicus* and *messeae* are found almost exclusively ; the former breeds especially in running water ; the breeding places of the latter, which is responsible for a prevalent benign type of malaria, are stagnant pools. Dalmatia, considered by the author under three headings, central, northern and southern, exhibits quite different conditions. In the central region, where malaria is locally severe, *A. m. typicus* is the dominant type, though in the interior *labranchiae* (eggs identical with those of this race studied by the author in Italy) was met with for the first time. The races *typicus* and *messeae* were found in northern Dalmatia, where, however, at the beginning of June, *labranchiae* formed 34 per cent of the total anopheline population, coinciding with malarial endemicity of a very high order. In southern Dalmatia, which includes the valley and mouths of the Neretva river, *A. m. messeae* and *A. elutus* alone were met with, and these again constituted the anopheline fauna of the coastal belt of Montenegro. In Macedonia at the time of the author's visit, the only races observed were *A. m. typicus* and *A. m. messeae* ; although these sometimes occurred together, a pure population of the former was usually found. All centres investigated in this country have a malarial rate between 40 and 90 per cent. ; while the rôle of the two races mentioned is therefore important, that of the later-appearing but very widely distributed *A. superpictus* (*vide supra*) must not be overlooked.

"Remarks concerning various types of eggs" conclude the paper. The eggs of *A. m. labranchiae* found by the author were precisely as described by MISSIROLI, MARTINI, HACKETT *et al.*, as were normally those of *A. m. messeae* and *A. m. typicus* ; but among the eggs of the

two latter, aberrations—connected with the normal type by intermediate gradations—were met with and are duly characterized.

It is noted that, in Dalmatia and the coastal region of Montenegro, kala azar seems to be much more widely distributed than has hitherto been believed, and that close study is needed in order to separate it from malaria, since these two maladies are frequently superimposed.

E. E. A.

HINMAN (E. Harold). **Studies upon the Problem of Races of *Anopheles quadrimaculatus* Say in the United States.**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 303–309. [10 refs.]

Although *A. quadrimaculatus* is the "most important malarial vector" in U.S.A., no attempt has yet been made to discover whether, like its near ally *A. maculipennis*, it is divisible into races or subspecies. Even in the case of *A. maculipennis* itself the racial question so far has not been studied on the North American continent, though the species occurs here and there from Newfoundland to California. The discovery by the author, in late November, of "vast numbers" of hibernating females of *A. quadrimaculatus* in a deserted fort in Southern Louisiana, whereas hibernation *en masse* was not supposed to be a characteristic of this species, led to further observations in the same locality, extending intermittently over four and a half years. As a result, while such local hibernation of *A. quadrimaculatus* was confirmed, no evidence of subspecific or racial difference was afforded by either eggs, larvae or adults.

E. E. A.

SIMMONS (James Stevens). ***Anopheles* (*Anopheles*) *punctimacula* Naturally Infected with Malaria Plasmodia.**—*Amer. Jl. Trop. Med.* 1936. Mar. Vol. 16. No. 2. pp. 105–108.

Anopheles punctimacula, which has also been known as *A. strigimacula* and *A. malefactor*, is one of the Arribalzagaia group, and breeds in shaded pools in Panama. According to general belief it is not susceptible to infection. The author reports the examination of a specimen infected with sporozoite-containing zygotes which was caught in a bedroom at Fort Sherman in the Canal Zone.

W. F.

SIMMONS (James Stevens). **The Infection of *Anopheles* (*Anopheles*) *punctimacula* with Malaria.**—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 455–460. [11 refs.]

In November 1935 a naturally infected specimen of *Anopheles punctimacula* (syn. *A. malefactor*, *A. strigimacula*) was captured near Limon Bay in the Panama Canal Zone. Subsequent laboratory investigation has shown that this species has a high degree of susceptibility to infection with both *P. vivax* and *P. falciparum*. These observations are of importance as *A. punctimacula* is one of the most prevalent anophelines in the unsanitated areas of the Canal Zone, as it is in many adjacent countries from Mexico to Brazil. (In earlier reports regarding its distribution it may have been confused with *A. neomaculipalpus* (Curry, 1931).)

Hitherto, ever since Darling's unsuccessful attempts at infecting it in 1908, *A. punctimacula* has been regarded as of no importance in so far as the transmission of malaria is concerned.

N. W.

BARBER (M. A.) & RICE (J. B.). **Methods of dissecting and making Permanent Preparations of the Salivary Glands and Stomachs of Anopheles.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 32-40. With 3 figs.

The method of dissection described is rapid and easy to learn and may be practised without the use of a dissecting microscope. The mosquito is lightly chloroformed. The legs are removed and the head cut off by a clean stroke of a lancet-headed needle. The insect is then laid on its side in a shallow drop of saline. The thorax is steadied with the needle, a small cover-glass (6 by 6 mm.—cut from larger cover-glasses or obtained from dealers) is taken up in a pair of finely pointed curved forceps and sloped on the thorax as shown in a figure. The forceps are then released and the tips placed on the top of the cover-glass. The cover-glass is pressed down gently, while the torso is moved to the left. The effect is to press out the glands and leave them under the cover-glass. The stomach is extracted by holding the thorax with the needle, seizing the tip of the abdomen with the forceps, and slowly drawing out the stomach. The authors also describe a method of making permanent preparations of glands, stomachs, etc., without removal of the cover-glass from the dissections. The paper contains a great many valuable hints that must be read in the original.

V. B. Wigglesworth.

SICAULT (G.), MESSERLIN (A.), LUMMAU (J.) & FRITZ (J.). Le paludisme dans le Rharb. [**Malaria in the Rharb (Morocco).**]—*Bull. Inst. Hyg. Maroc.* Rabat. 1935. No. 1-2. pp. 5-91. With 7 plates. [4 pages of refs.] [Summarized in *Rev. Applied Entom.* Ser. B. 1936. June. Vol. 24. Pt. 6. pp. 123-124.]

"A very detailed account is given of work on malaria and its control in the marshy plain of the Rharb (Morocco) from 1931 to 1934. Since 1933 measures against Anopheline larvae have been undertaken on a large scale. The commonest Anopheline is *Anopheles maculipennis* var. *sicaulti*, Roub. The use of *Gambusia holbrooki* against mosquito larvae has already been described [see this *Bulletin*, 1935, Vol. 32, p. 819.]

"The following is taken from the summary of the section dealing with entomological studies. Among the Anophelines of the Rharb, one or perhaps several anthropophilous races of *A. maculipennis*, Mg., are of importance. The anthropophilism is probably produced by the natural surroundings, since there are scarcely any shelters on the large windy plains except human habitations, wild animals are rare, and flocks live in the open. In the summer, however, the Anophelines are so abundant that they shelter among rushes, cactus, etc. The low density of the population explains the great distances covered by the mosquitos in search of food. Larvae of *A. maculipennis* are found during the winter but are then usually in the third or fourth instars, and oviposition seems to cease in most years between December or January and March or April. During the cold months eggs are only laid in breeding places offering stable conditions of temperature and shelter, and ample nourishment. In the spring, oviposition appears to be influenced by minimum temperature; when this is constant in the neighbourhood of 8°C. [46.4°F.] eggs are found throughout the region. When the maximum winter and spring temperatures are high and the

minimum temperatures vary widely from one week to the next, oviposition occurs throughout the winter, but the number of Anophelines produced is generally moderate. When the winter is cold, rainfall is high, and the minimum temperature remains below 8°C. for some time and then rises suddenly to 10–13°C. [50–55·4°F.], spring oviposition is retarded. Conditions are, however, favourable for development, the larval period is shortened, extensive breeding places have been created by the rains, and a considerable outbreak of Anophelines occurs. The high humidity that seems to be necessary for Anopheline activity prevails throughout the region. When the hot dry south-east winds lower the humidity, Anophelines seek shelter in houses and large numbers die. Violent rain storms destroy most of those sheltering in the open.

"After discussing the epidemiology of the disease, the authors conclude that outbreaks are an indirect result of high rainfall (in a country where malaria is endemic), which, owing largely to the impermeability of the soil, increases the number and extent of breeding places and consequently the abundance of Anophelines.

"The anti-larval work that has been carried out in various localities is outlined. It consisted chiefly of drainage and the application of oil or Paris green. In certain localities the measures were ineffective, partly because the zone treated was not sufficiently wide to prevent the invasion of the Anophelines, which have been found to fly three miles or more."

SICAULT (G.). Note sur l'épandage du vert de Paris per avion au Maroc. [**Distribution of Paris Green from Aeroplanes in Morocco.**] - *Bull. Inst. Hyg. Maroc.* Rabat. 1935. No. 1–2. pp. 93–102. With 2 plates. [Summarized in *Rev. Applied Entom.* Ser. B. 1936. June. Vol. 24. Pt. 6. pp. 124–125.]

"Larvicidal fish cannot be established against Anopheline larvae in large areas of the extensive marshes in the Rharb district of Morocco because they dry up entirely in years when there is little rainfall. Oil cannot be used effectively in many cases because vegetation is abundant. Dusting with Paris green would give control, but at the edges of the marshes the mud is too soft to walk on and the water is too shallow to allow the use of a boat. For these reasons, the experiments described were carried out in 1934 to determine the possibility of dusting by means of aeroplanes.

"Preliminary laboratory experiments with dusts of Paris green and powdered stone in different proportions showed that one with 2 per cent. Paris green was as effective as others with 5, 10, 15 and 20 per cent. The stream of dust was regulated so that when the aeroplane was flown at a height of approximately 50–100 ft. on a still day the amount of dust was about 0·3 oz. per sq. yd. (a rate that is considered to be effective) over an area about 40 yds. wide. Even a slight breeze displaced the dust cloud considerably, and in this case a second journey was made along the edge of the marsh, the line of flight being altered to compensate for the degree of displacement of the dust cloud noted on the first journey. On 5th, 6th and 7th June, dust was applied by aeroplane to marshes that had contained 8 larvae (all instars) per dip; on 8th and 9th June no pupae and no larvae of the 3rd and 4th instars were found in the treated marshes, although there were a few 2nd instar larvae and quite a number in the 1st instar. The larval density

in untreated marshes remained unchanged. The result was considered satisfactory, but as the average length of the larval period in Morocco is about 15 days, it was decided that dust should be applied at intervals of 10 days. Dusting was carried out in certain localities throughout the summer. In the area for which figures are given, the effectiveness of the treatment is shown by the sudden increase in the numbers of larvae after the dusting ceased. The actual effect on the transmission of malaria was difficult to estimate, particularly as it was not possible to begin dusting until after the emergence of the first generation of Anophelines, and as the populations of a number of villages had been subjected to prophylactic treatment. On the other hand both the native and European residents remarked on the great decrease in the numbers of adult mosquitos; this was not, however, due entirely to dusting, for in a number of breeding places *Gambusia* had become sufficiently numerous by August for its action to be effective.

"The cost of the dusting is discussed. It is slightly more expensive than oiling and must be carried out at shorter intervals. From August onwards a considerable economy was effected by using a finer mixture (Paris green with an impalpable powder), which dispersed over a wider area and affected 1st and 2nd instar larvae, which are unable to ingest large particles."

SAUTET (Jacques). Contribution à l'étude des culicidae et en particulier de ceux jouant un rôle important dans la transmission du paludisme.—*Rev. Méd. et Hyg. Trop.* 1936. Mar.-Apr. & May.-June. Vol. 28. Nos. 2 & 3. pp. 65-96; 129-160. With 6 figs.

REUTER (Johannes). **Oriënteerend onderzoek naar de oorzaak van het gedrag van *Anopheles maculipennis* Melgen bij de voedselkeuze.**

This book was reviewed in Vol. 33, p. 415.

SENEVET (G.). Les moustiques de la Martinique.—*Arch. Inst. Pasteur d'Algérie.* 1936. June. Vol. 14. No. 2. pp. 123-134. With 5 figs. [11 refs.]

BARBER (M. A.), RICE (J. B.) & MANDEKOS (A.). **A Dustless Method of diluting and spreading Paris Green in Malaria Control.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 41-44.

The method described is of great interest and practical importance. It consists in mixing Paris green with kerosene oil. In the dilutions employed the kerosene does not act as a larvicide; it merely facilitates the spreading of the Paris green and keeps it afloat. The authors carry to the field small containers containing 10 gm. of Paris green in 20 cc. of kerosene. For use this is mixed, on arrival at the place to be treated, with about 250 volumes of water; this mixture has to be kept agitated during spraying. The spray cloud should have a greenish tint. The results seem to be as good as those obtained with Paris green and road dust. The authors have used a horticulturists' sprayer of 12-quart capacity with a fine spray.

A second ingenious method of using the mixture is as follows. Pebbles, small stones, provided they are not absorbent, or even coarse sand, some or all of which are nearly always available near the breeding place are placed in a pan or basket, wetted and drained. The Paris

green-kerosene mixture, undiluted, is well shaken and poured over the pebbles which are then thrown widely over the breeding place. Where a pebble strikes the water the mixture remains on the surface and spreads. Castor oil, 1 or 0.5 per cent., is usually added to the mixture when thus used, to insure spreading. By this pebble method of application places difficult of access may be treated. It has given good results. N. W.

MURRAY (David R. P.). **Mineral Oils as Mosquito Larvicides.**—*Bull. Entom. Res.* 1936. July. Vol. 27. Pt. 2. pp. 289–305.

The work described in this report was carried out in the Department of Entomology of the London School of Hygiene and Tropical Medicine. It contributes interesting and valuable information as to the manner in which mosquito larvae die under oil treatment.

The fact that oils enter the tracheae of mosquito larvae was made the starting point of the investigations described and an attempt is made to supply answers to two questions:—Is the presence of oil in the trachea invariably fatal to larvae? Does the presence of an oil film, covering the whole of the water surface, invariably lead to the penetration of oil into the tracheae of all the larvae under it?

The inner surface of the trachea of a mosquito larva is wetted by oils but not by water. Its non-wettability by water is apparently explained by the presence of a layer of waxy material covering it.

The mosquito larvae used in the experiments were laboratory reared *Aedes aegypti*, *Culex fatigans* and *Anopheles maculipennis*. Of these *C. fatigans* proved to be most useful: the tracheae of its larvae stand out very clearly when live larvae are examined under a 30-magnification binocular. In these conditions it is easy to see if, and to what extent, the tracheae have been oiled.

The presence of oil in the trachea of a larva is invariably fatal. In no case did a larva with an oil-filled trachea pupate although, in certain circumstances, death may be long delayed. Wide divergencies of survival time are, in some cases, due to differences in the amount of oil taken in. It is very doubtful whether a larva ever eats after it has been oiled. Penetration of oil into the larval tracheae is influenced by the nature of the oil spread and by the age of the film. Penetration was found to be most rapid with oils of middle boiling range (approximately 200°–300°C.). Oils of boiling range above 300°C. are less likely to penetrate, owing to their higher viscosity; this was at any rate the case at the temperatures at which the experiments were carried out.

The penetrating power of the oil film deteriorates with the age of the film, though the thickness of the film influences the rate of deterioration. It appears, therefore, that endeavours to obtain a film of great durability are not justified.

The chemical composition of the oil determines its toxicity. Refined paraffin oils are non-toxic. Oils with a high proportion of aromatics are more rapid in their lethal action. In practice, however, toxicity is of secondary importance. The main desideratum is to obtain an oil that readily penetrates the trachea, that is to say, a medium boiling range oil, not so involatile as to be too viscous and not so volatile as to produce an immediate irritating effect causing collapse of the trachea.

The results obtained with pupae were somewhat contradictory. The pupae of *C. fatigans* are more difficult to kill with oil than are larvae; they can survive in circumstances in which all larvae are oiled

with fatal result. Pupae of *A. maculipennis*, however, are much more susceptible to oil ; this is probably explained by the different shape of the trumpets which, being oblique in the Anopheline pupa, present much larger openings for the oil to enter. N. W.

MAY (Raoul M.). L'hexachloréthane dans la lutte contre les moustiques. [**Hexachlorethane as a Mosquito Larvicide.**]—*Ann. Inst. Pasteur*. 1936. Sept. Vol. 57. No. 3. pp. 325–336. With 2 figs.

The disadvantages and limitations of mosquito larvicides hitherto employed were responsible for the investigations described in this paper, as a result of which the author believes that hexachlorethane, C_6Cl_6 , is of very great value as a larvicide. The gas given off by hexachlorethane by sublimation kills adult mosquitoes and is not harmful to human beings. In a closed atmosphere 0.070 gm. in 10 litres of air kills adult mosquitoes in an hour and a half. Larvae and pupae in water exposed to air saturated with hexachlorethane all succumb. Such observations led the author to consider the possibilities of utilizing hexachlorethane as a larvicide though the idea of using a gas for this purpose is a new one.

The method finally adopted was to apply a mixture of two parts of hexachlorethane and one part of talc, both very finely powdered, to the surface of the water ; a layer of gas is thus formed. It was found very difficult to grind pure hexachlorethane sufficiently fine : to overcome this difficulty it was dissolved in a slight excess of trichlorethylene. To the solution is added very finely powdered talc. After mixing, the trichlorethylene is evaporated by exposure to the air ; the dry residue is ground and passed through a sieve. On a commercial scale it would be necessary to recover the trichlorethylene by distillation under reduced pressure at a low temperature.

A thin layer of the powder on the surface of the water suffices to kill all larvae and pupae. With a blower about five and a half kilograms were required to treat 100 square metres of surface.

The advantages claimed for the method are that the water treated is not rendered unfit for domestic use or for the watering of vegetables ; that fish, crustaceans and water plants are unharmed ; that the powder is not toxic either for man or animals ; that the powder penetrates well amongst algae and other water plants ; that it is not very costly, and that the larvae and pupae of all kinds of mosquitoes are killed. In short it is said to possess the advantages of both the oil and chemical larvicides hitherto in general use. N. W.

DANILOVA (M.) & LAPPINE (G.). Sur le transport des Gambusia. [**Transport of Gambusia.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 4. [In Russian pp. 579–582. French summary p. 583.]

The authors found that, if the journey does not last longer than 8 days and the vessel is open to free exchange of gases with the surrounding atmosphere and the temperature of the water is maintained at 13°–16°C., as many as 20 fish per litre can be safely carried. If the container has to be closed, as for example in a journey by rail, the same number can be carried provided the vessel is only half filled. *Gambusia* can live without feeding for a month, and if stored in an aquarium with

submerged vegetation much longer. The presence of rust is a negligible factor. With water containing vegetation a salinity of 1.5 per cent. does no harm, but where there is no vegetation, the fish may die when the salinity is only 1 per cent.

H. H. S.

KOULAGUINE (S.) & MARZINOVSKI (V.). Essai d'acclimatation des *Gambusia* dans les étangs réfrigérants d'une centrale électrique. [**Habituation of *Gambusia* to Refrigerating Pools.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 1. [In Russian pp. 52–61. [28 refs.] French summary (5 lines) p. 61.]

The authors have succeeded in acclimatizing *Gambusia* to the refrigerating pools of an electric central station in Moscow. The fish had been imported from the Caucasus. It was found that under the new conditions they thrived well and multiplied to a degree sufficient to permit of all the malaria stations where antilarval measures were undertaken to be supplied.

H. H. S.

BOYD (Mark F.), STRATMAN-THOMAS (W. K.) & KITCHEN (S. F.). **Modifications in a Technique for the Employment of Naturally Induced Malaria in the Therapy of Paresis.**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 323–329.

All mosquitoes are bred in insectariums, no wild mosquitoes are used. A supply of 200 *A. quadrimaculatus* is always kept in cold storage and the stock is renewed every two weeks if not utilized. Their food consists of 10 per cent. glucose solution. The McCoy strain of benign tertian, which has been maintained for more than 4 years, is used for the treatment of white patients. *P. malariae* is not recommended. *P. falciparum* is employed in the treatment of negroes. Many different strains are used. Infected mosquitoes incubating the sporogonous cycle are kept at 20°C., with a relative humidity of 85 per cent.

Four infected mosquitoes are used in conveying *P. vivax* and 6 or 8 in the case of *P. falciparum*. Mosquitoes are not reliable for more than 30 days after infection with *P. vivax* and not more than 20 days after infection with *P. falciparum*. The course of the infection in man is controlled by counting the parasites. Parasite counts of over 100,000 in *P. falciparum* infections indicate the necessity for treatment.

IV. F.

RUBINSTEIN (B. N.). Die Behandlung der Impfmalaria bei Paralytikern mit dem neuen synthetischen Präparat Acrichin. [**Treatment of Inoculated Malaria with the New Drug Acrichin.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Apr. Vol. 40. No. 4. pp. 167–169.

Acrichin (Dichlorhydrat-2-methoxy-6-chlor-9-diätylamino-butylamino-acrichin) is an analogue of atabrin. It was tested in cases of general paralysis inoculated with *Plasmodium vivax*. It has been found valuable in terminating the infection. No instance of relapse has been noted. The therapeutic effect of the malaria in general paralysis is not interfered with by acrichin, and there is no unfavourable action on the psychical condition of the patient. Acrichin is either given by mouth in doses of 0.1 gm. thrice daily for seven days, or by intravenous injection daily for one week, the dose being 5 to 8 cc. of a 3 per cent. glucose solution of acrichin, the same dose twice daily if given intramuscularly. Twenty-one cases were studied.

E. D. W. Greig.

- BOMPIANI (Gaetano). Le alterazioni del rene nella malaria sperimentale da "Plasmodium knowlesi" nel "Macacus rhesus."—*Sperimentale*. 1936. Aug. Vol. 90. No. 4. pp. 359-397. With 9 figs. [85 refs.] English summary.
- WANG (C. W.). Two Cases of Malignant Malaria in Narcotic Addicts in Peiping: its Possible Transmission in the Intravenous Administration of Heroin.—*Chinese Med. Jl.* 1936. Mar. Vol. 50. No. 3. pp. 270-272.
- TIMPANO (P.). Il metodo di M. Ascoli nella cura della splenomegalia da malaria e da kala-azar.—*Policlinico*. Sez. Prat. 1936. Nov. 9. Vol. 43. No. 45. pp. 2007-2009.

TROPICAL DERMATOLOGY.

A REVIEW OF RECENT ARTICLES, III.*

Blastomycosis.—During the past twelve months publications have been mostly concerned with the fungi causing chromoblastomycosis. Thus EMMONS and CARRIÓN¹ have worked with *Hormodendron pedrosoi*, the fungus most commonly found in cases of this disease in South America and Porto Rico. Their investigations have been most carefully executed. Many strains of the organism were obtained from different sources and were all compared with similar or related fungi. All the characteristic features of this agent are considered and it is shown that it is closely allied to the saprophytic species of the genus in its similar but slow growth habit, its pigmentation and its production of branching chains of spores. The subterminal elements of these chains are true spores and this chain formation distinguishes the fungus from the *Acrotheca* and *Trichosporia*. Successful animal inoculations have been carried out with some saprophytic species of *Hormodendron*, so adding to the evidence demonstrating the close relationships which exist between the pathogenic and saprophytic species. CARRIÓN² draws attention to a new clinical type caused by *H. compactum*, for the fungus isolated from the lesions appears to belong to a new species. The organism is described in great detail and among its features the following differences are mentioned. Growth is always slow and cultures on maltose agar never attain the size of *H. pedrosoi*. The culture is irregular, uneven and tufted, never smooth and regular. The edge is indented and scalloped, whilst the substrate is a hard and brittle mat instead of being elastic. On dextrose agar the hyphae of *H. compactum* are coarser, the cell-walls are thicker and more irregular, whilst the cells themselves show more pigmentation and larger droplets. This organism was obtained from lesions present on the left arm of a white labourer in Porto Rico. This man, now aged fifty, first noticed a small growth on the front of the left wrist twenty-eight years ago. The original nodule gradually spread so as to involve most of the limb up to the middle of the arm. The spread always occurred by peripheral extension and not by the satellite deposits which are seen in other cases of this disease. The lesions themselves were mostly psoriasiform, dull red or violaceous in colour. In places there was slight papillomatosis and ulceration but no nodules or large vegetative tumours were found. Lastly, in some areas the appearance was very suggestive of lupus erythematosus. The first case of chromoblastomycosis to be detected in Uruguay was described in the *Arch. Urug. med. cir. esp.*, 1934, Vol. 5, p. 201. The fungus then isolated has now been studied very fully by MACKINNON³ and the organism appears to be identical

* For the second of this series see Vol. 33, p. 138.

¹ EMMONS (C. W.) & CARRIÓN (A. L.). *Hormodendrum pedrosoi*. An Etiological Agent in Chromoblastomycosis.—*Puerto Rico Jl. Public Health & Trop. Med.* 1936. June. Vol. 11. No. 4. pp. 639-650. With 29 figs. on 6 plates. [10 refs.] [Spanish version pp. 651-662]

² CARRIÓN (A. L.). Chromoblastomycosis. A New Clinical Type caused by *Hormodendrum compactum*.—*Puerto Rico Jl. Public Health & Trop. Med.* 1936. June. Vol. 11. No. 4. pp. 663-682. With 8 plates. [15 refs.] [Spanish version pp. 683-702]

³ MACKINNON (J. E.). Description d'une souche de *Phialophora verrucosa* Thaxter (Medlar, 1915) isolée du premier cas de dermatite verruqueuse observé en Uruguay.—*Ann. Parasit. Humaine et Comparée*. 1936. Jan. 1. Vol. 14. No. 1. pp. 78-84. With 1 fig.

with *Phialophora verrucosa* Thaxter. It is claimed that Medlar's description of this fungus in 1915 was incomplete and that this paper does actually round off the study of the organism. A typical case of chromoblastomycosis is portrayed by MARTIN, BAKER and CONANT⁴ in a well-illustrated article, the patient being a North Carolina negro having disease of the left hand and arm of four years' duration. They claim that very definite improvement occurred after iontophoresis with copper sulphate. But the most interesting part of the paper concerns the pathological investigations. They found specific complement-fixing bodies to the fungus (*H. pedrosoi*) in the serum. Also when the blood was tested against fourteen other strains of fungi of the Hormodendron type all but one of these fixed the complement to some degree.

Mycetoma.—One example of this disease is reported from Montevideo by TALICE,⁵ but clinical details are restricted to the statement that a small nodule was excised from the finger of a male native. From the mycological point of view the outstanding feature was the presence of reddish-orange grains, the largest of which measured 200 μ in diameter. This constitutes the second report in the literature, the first case having been seen in 1918 in the Anglo-Egyptian Sudan by BALFOUR and ARCHIBALD. The author proposes to create a new genus for this fungus, *Rubromadurella* and to call this species *R. langeroni*.

Actinomycosis.—TALICE⁶ is also responsible for the first description of mycotic concretions in the lachrymal ducts to be reported from Uruguay. In these ducts, particularly in the lower lids, there were found multiple tiny, soft, friable, greyish or yellowish grains. Calcareous infiltration was found in the older masses. Clinically there was some swelling at the edge of the affected eyelid, with a little local conjunctivitis at the puncta but there was no actual invasion of the tissues. The disease is rare but is generally distributed throughout the country and is seen in female farm workers. It seems probable that the only causative fungus is that most common of the saprophytic actinomyces, *A. israeli*. The same author in collaboration with SICARDI and REGULES⁷ also describes a case in which an actinomyces (species undecided) actually invaded the tissues of the eye. The disease followed local injury with a piece of dry wood, some splinters of which remained in the wound with consequent intense local inflammation and suppuration. At first antiseptic dressings only were used but gradually small nodules appeared round the cornea, all below the level of the original wound. These globules were of 1 to 2 mm. in diameter, bright red and each bore a central yellow point. Puncture

⁴ MARTIN (Donald S.), BAKER (Roger D.) & CONANT (Norman F.). A Case of Verrucous Dermatitis caused by *Hormodendrum pedrosoi* (Chromoblastomycosis) in North Carolina.—*Amer. J. Trop. Med.* 1936. Sept. Vol. 16. No. 5 pp. 593-619. With 5 plates. [24 refs.]

⁵ TALICE (R. V.). Sur un cas de maduromycétome à grains rouges observé à Montevideo.—*Ann. Parasit. Humaine et Comparée.* 1935. Nov. 1. Vol. 13. No. 6. pp. 585-590. With 1 fig.

⁶ TALICE (R. V.). A propos d'un cas de concrétions mycosiques primitives des canaux lacrymaux.—*Ann. Parasit. Humaine et Comparée.* 1936. Mar. 1. Vol. 14. No. 2. pp. 164-170. With 3 figs.

⁷ SICARDI (J. A.); REGULES (U.); TALICE (R. V.). Un cas intéressant d'actinomycose conjonctivosclérale d'origine traumatique. I. Etude clinique [SICARDI & REGULES]. II. Etude mycologique [TALICE].—*Ann. Parasit. Humaine et Comparée.* 1936. Mar. 1. Vol. 14. No. 2. pp. 171-176. With 1 fig.

yielded a muco-purulent liquid. Treatment with potassium iodide internally and sodium iodide locally was instituted. Healing then occurred but left a grey-blue discoloration at the site, which it is claimed is characteristic of old conjunctivo-scleral actinomycosis. From Japan there comes the report of a case of "dermatitis verrucosa" by KAMBAYASHI and ANDO,⁸ this being the second case to be described in that country. The patient was a nineteen-year-old lad who lived in Tokio and who gave a nine years' history. The disease started on the right great toe on that part of the skin where the thong of the sandal produces some friction. The toe and adjacent part of the dorsum of the foot were swollen, brownish and bore livid dark red nodules. Crusts and sinuses were also present. A similar patch covered an area of two inches diameter below the external malleolus of the right leg, which as a whole was larger than the left leg. Histological and cultural details are included in the paper and there seems no doubt that the fungus was an actinomyces.

Cephalosporium.—The whole literature of infections with this organism is reviewed by KROEMER⁹. In Central Europe some cases start like an impetigo with, later, deep pustules; others show subcutaneous "gummatous" nodules which may also be found in the mucous membranes and which are very suggestive of actinomycosis of the jaw. The author worked with two strains of the fungus and concludes that the various types which have been described by Benedek, Grütz and Pollacci are all really identical one with another and with *C. acremonium*, Corda.

Sporotrichosis.—From Uruguay comes the report by TALICE¹⁰ of two cases of this disease in which the *S. asteroides* of Splendore was isolated. Although both patients had gummatous lymphangitis of the forearm, only one of them is described in detail. This account deals with a native laundress, aged 28, whose single lesion had been present for seven years. From one sinus a little brownish clear fluid could be expressed. Local anaesthesia allowed complete excision of this "gumma." The rest of the paper is concerned with pathological investigations, and is concluded by the reasons why the author regards the organism (sporothrix) as a variety of *Rhinocladium beurmanni*.

Coccidioidosis.—The article by JORDAN and WEIDMAN¹¹ deserves very close study. In North America most cases of coccidioidal granuloma are due to *C. immitis*, whilst in South America *Paracoccidioides brasiliensis* is the usual offender. Confusion has arisen because the differences between these two organisms have not been fully appreciated and the authors confirm Almeida's original conclusion that the two are radically different. Among the very full details considered the

⁸ KAMBAYASHI (T.) & ANDO (K.). Ein Fall von Dermatitis verrucosa in Japan.—*Arch. f. Dermat. u. Syph.* 1936. July 13 Vol 174. No. 4. pp. 377-384. With 7 figs.

⁹ KROEMER (Gerhard). Ueber die bisher bekannten menschlichen Cephalosporium-Infektionen, nebst Untersuchungen ueber zwei verschiedene Stämme von *Cephalosporium acremonium* Corda.—*Ztschr. f. Parasitenk.* 1936. Mar. 4. Vol. 8. No. 3. pp. 317-331. With 8 figs. [28 refs.]

¹⁰ TALICE (R. V.). Deux cas de sporotrichose produits par le *Sporotrichum astéroïde* de Splendore.—*Ann. Parasit. Humaine et Comparée.* 1935. Nov. 1. Vol. 13. No. 6. pp. 576-583. With 1 fig.

¹¹ JORDAN (James W.) & WEIDMAN (Fred D.). Coccidioidal Granuloma. Comparison of the North and South American Diseases with Special Reference to *Paracoccidioides Brasiliensis*.—*Arch. Dermat. & Syph.* 1936. Jan. Vol. 33. No. 1. pp. 31-47. With 6 figs. [13 refs.]

following features may be mentioned. The colonies of *C. immitis* are large and spreading, the mycelium develops rapidly in hanging-drop preparations and in them chlamydospores, arthrospores and clubbing of terminal hyphae can be observed; the round forms occur only in tissue. Pathogenicity for animals is high and affects many species. The colonies of *P. brasiliensis* are small and compact, whilst in hanging-drop preparations the mycelium is confined to the region of the ex-plant and there are numerous chlamydospores. No round forms are seen in tissue and its pathogenicity for animals is low, being confined to rats. It is therefore concluded that paracoccidioidal granuloma is a third disease which must be added to blastomycosis and coccidioidal granuloma when the differential diagnosis arises. Clinically the cutaneous lesions of these two coccidioidal diseases are practically identical, but in the Brazilian form the portal of entry seems to be around the mouth. The Brazilian disease causes marked adenopathy but *never* shows involvement of bones. A more recent paper by SILVA¹², however, describes four cases of infection with the *P. brasiliensis*, three of which showed rare features. One case of four years' duration did not have any invasion of the mucous membranes. The second patient also suffered from a lung cavity caused by the fungus, whilst the last did have slight but definite bone involvement. This writer also stresses the differences between the North and South American varieties both clinically and culturally.

Favus.—LANGERON and BAEZA¹³ report the results of a study of the fungi obtained from 304 cases of favus seen in the Spanish zone of Morocco. Morphological and cultural details are full. The authors divide the organisms into three groups:—(a) typical *Achorion Schönleini*, which grows on the surface of the medium; (b) growths which are more adherent and which show superficial invasion of the medium, such as the types *pittalugai*, *talicci*, *debueni* and *brumpti*; (c) fungi which penetrate deeply into the medium, type *milochewitchi*. There is a final discussion of the whole group of *Favotrichophyta*, as suggested by Neveu-Lemaire in 1921. The natural course of the disease has been rarely studied, but CATANEI¹⁴ has kept 23 native children under observation in Algeria for periods of two to seven years. The patients, of whom nineteen were boys, varied from two to thirteen years of age. They all had lesions of the scalp whilst seven of them also showed affection of the glabrous skin. No treatment whatever was given and the children were frequently examined. It was found that the disease heals spontaneously, often without leaving any definite scars. Even in the worst and most chronic cases patches of local recovery had appeared before the conclusion of the period of observation. What may prove to be a new species is reported from India, where DEY and MAPLESTONE¹⁵ obtained material from a boy living in

¹² SILVA (Flaviano). Commentarios em torno de alguns casos de blastomycose por "Paracoccidioides brasiliensis" observados na Bahia.—*Brasil-Médico*. 1936. Aug. 15. Vol. 50. No. 33. pp. 706-715. With 15 figs. French summary.

¹³ LANGERON (M.) & BAEZA (M.). Sur les dermatophytes qui causent la teigne favreuse humaine.—*Ann. Parasit. Humaine et Comparée*. 1936. July 1. Vol. 14. No. 4. pp. 385-402. With 36 figs. on 6 plates. [14 refs.]

¹⁴ CATANEI (A.). Évolution naturelle du favus en milieu indigène algérien.—*Arch. Inst. Pasteur d'Algérie*. 1935. Dec. Vol. 13. No. 4. pp. 495-509. With 5 plates.

¹⁵ DEY (N. C.) & MAPLESTONE (P. A.). Favus in India.—*Indian J. Med. Res.* 1936. Jan. Vol. 23. No. 3. pp. 687-699. With 17 figs. (9 coloured) on 5 plates & 1 text fig.

Rajputana. The characters of this fungus are described very fully. It has end-organs similar to those of *A. Schönleini* but it has additional funnel-shaped terminal chlamydospores. The name *A. actoni* n. sp. is suggested.

Tinea tonsurans.—In Calcutta DEY and MAPLESTONE¹⁶ have seen 53 cases of ringworm of the scalp during the last three years. Of these, 2 were due to favus, 20 to *T. violaceum* and the rest were caused by *M. audouini*. There were no unusual clinical features. It is noteworthy, however, that this is the first record of the occurrence of *T. violaceum* in India. For this reason the cultures of the fungus are described very fully and it is observed that "the violet colour always fades and finally disappears on repeated subculture." It is suggested that on botanical grounds this organism would be more correctly classed as an Achorian, the name which was actually first given to it in 1902 by Bodin. During this investigation no other species of Trichophyton was found. CATANEI¹⁷ continues his studies in North Africa and has now reported his findings in Aures, a mountainous part of Algeria. Here 528 children under sixteen years of age were seen. The incidence of infection varied greatly in different settlements, the disease being completely unknown in some. Favus (*A. Schönleini*) was more common than trichophytic infections but where the latter do occur, *T. violaceum* and *T. glabrum* are responsible. Clinically all the lesions seen in this district were localized and attenuated. The same author¹⁸,¹⁹ discusses the difficult subject of acquired resistance in mycotic diseases. Trichophytic, sporothritic, blastomycotic and actinomycotic infections are all considered. He claims that all give rise to allergy and that this is the cause of the aggravation sometimes seen as a result of superinfection or inoculation of antigens. In the superficial types of fungus infection, allergy only appears after invasion of the hair has occurred. Deep infections with pus-formation establish a resistance against superinfection, *i.e.*, an acquired resistance in which clinical cure coincides with disappearance of the organism. There is no latent stage in which fungi are present without clinical signs. A few mycotic lesions seem to be succeeded by true immunity. That allergy really can exist during the period of infection is shown not only by the reactions to such antigens as trichophytin but also by the spontaneous appearance of the "ide" eruptions. PENNINGTON²⁰ points out that fungus sensitivity is a frequent cause of the allergic dermatoses, but it is very often combined with other sensitizations, *e.g.*, to foods and inhalants. These allergic lesions mostly occur on the hands and feet, a distribution which is by no means a reliable criterion as to

¹⁶ DEY (N. C.) & MAPLESTONE (P. A.). Ringworm of the Scalp in India.—*Indian Med. Gaz.* 1935. Oct. Vol. 70. No. 10. pp. 541-544. With 4 figs. & 1 coloured plate. [12 refs.]

¹⁷ CATANEI (A.). Les teignes dans des agglomérations indigènes de l'Aurès.—*Arch. Inst. Pasteur d'Algérie.* 1936. Mar. Vol. 14. No. 1. pp. 9-14.

¹⁸ CATANEI (A.). Les caractères de la résistance acquise dans les mycoses.—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 451-457. [20 refs.]

¹⁹ CATANEI (A.). Les caractères de la résistance acquise dans les mycoses (immunité ou prémunition ?).—*Arch. Inst. Pasteur d'Algérie.* 1936. June. Vol. 14. No. 2. pp. 85-103. [27 refs.]

²⁰ PENNINGTON (Edna S.). An Evaluation of the Relative Role of Fungi (Trichophytin) and Other Allergens in Patients with Allergic Dermatoses.—*Southern Med. J.* 1936. Apr. Vol. 29. No. 4. pp. 407-410. [14 refs.]

the possible cause. Tests involving the use of trichophylin or oïdomycin are only trustworthy when focal reaction appears. When this does occur good results are obtained by specific treatment involving desensitization with fungus extracts. This paper is based on the study of 155 patients, 93 of whom were sensitive to fungi. In only 46 of these 93, however, was fungus sensitization the sole cause of the eruptions.

Epidermophytosis.—SOUTER²¹ has studied 114 cases of mycotic infections of the feet. In his hands Mycozol has proved the most efficient treatment but nevertheless he is not prepared to swear that even one of these cases is absolutely cured, the longest period of observation being only seven months. He stresses the great importance of frequent changing of the socks, powdering of the feet after washing, the use of special towels, etc. The following routine treatment is suggested: a preliminary seven days antiseptic course during which the feet are bathed twice a day in Eusol. After each bath the feet are dried and then dressed with Whitfield's lotion or Castellani's paint. At the end of this period liquid Mycozol is applied twice a day for "three weeks or more as necessary." In Louisiana HOWLES²² has investigated 2,086 cases of infectious intertrigo occurring over a period of twenty months in a prison which houses 1,800 convicts. The disease was found in 86.5 per cent. of new admissions and in 96.1 per cent. of inmates. Various cocci, yeasts and fungi were found, but in only 10 per cent. of the cases were pathogenic fungi discovered. Of these, *E. interdigitale* was the most common.

Monilia.—The comparative virulences of 27 strains of *Monilia* have been considered by MACKINNON and RODRIGUEZ-GARCIA.²³ Emulsions of the fungi were made in normal saline and were then injected into rabbits and mice, either intravenously or by the intraperitoneal route. They concluded that there is some relationship between the morphological types and the degree of virulence. Thus *Mycotorula* and *Candida* proved most pathogenic. *Mycotoruloides* and *Geotrichoides* take second place, whilst *Mycocandida* comes next and *Blasiodendron* proved the least virulent. It is believed that these findings are sufficiently stable to be of assistance in the identification of the various members of this group.

Animal Parasites.—Human infection with those members of the acari known as *Demodex* is sufficiently rare to excite interest. BATUNIN and IOLKIN²⁴ have studied the history of these infections (*Demodicitis hominis*) in both animals and man. Occasionally the spider may be found on an apparently normal skin; more often it may be found in eruptions which simulate eczema, impetigo or seborrhoeic dermatitis. Thorough treatment with a sulphur and salicylic acid ointment results in cure in those dermatoses when such an ointment might reasonably

²¹ SOUTER (J. C.). A Note on Fungoid Infections of the Feet with a Description of a Case.—*Jl. Roy. Nav. Med. Serv.* 1936. Jan. Vol. 22. No. 1. pp. 41-45. With 3 figs.

²² HOWLES (James K.). Infectious Intertrigo.—*Amer. Jl. Trop. Med.* 1936. Jan. Vol. 16. No. 1. pp. 77-90. With 3 charts. [12 refs.]

²³ MACKINNON (J. E.) & RODRIGUEZ-GARCIA (J. A.). Mesure et comparaison du degré de virulence des champignons levuriformes.—*Ann. Parasit. Humaine et Comparée*, 1936. July 1. Vol. 14. No. 4. pp. 403-407.

²⁴ BATUNIN (M.) & IOLKIN. Acariasis seu Demodicitis hominis.—*Dermat. Woch.* 1935. Nov. 2. Vol. 101. No. 44. pp. 1355-1361. With 5 figs.

be expected to make matters worse, thereby suggesting that the rash really is consequent on the presence of the parasite. Diagnosis of course depends on microscopy. A most important paper comes from the pens of SULZBERGER and KAMINSTEIN²⁵, in which is discussed the problem of human dermatoses caused by the mites of animals. After dealing briefly with the many types of animal acarine infections the authors pass to the eruptions due to non-burrowing mites such as the Trombidiidae and Gamasidae. The whole literature is reviewed and then an account is given of two groups of cases seen in New York City within one year. All of these were attributable to the ordinary red chicken-mite, *Dermanyssus gallinae*. In the first group three members of a family of four were affected, the husband being very heavily attacked. Each patient showed very numerous widespread scratch marks together with occasional pinhead-sized reddish papules and isolated, evanescent urticarial wheals. The thighs, legs, lower abdomen and waistline were particularly affected, the face remaining clear. It was noticed that itching increased very greatly after the death and subsequent handling of a pet canary which had scratched and bitten itself severely. The second group of cases was exactly similar and in them it had even been noticed that the trouble started soon after the purchase of a canary and that a sheet put over the cage at night was covered with "red spots" in the morning. Mites were found in both the cages concerned. The diagnosis may be suggested by more marked urticaria than is usually seen in scabies and by the great variations in susceptibility among individuals of the family. As it takes four to five months to rid a poultry house of these mites when once it has been infected it is obvious that simple removal of bird and cage may not result in rapid alleviation of the symptoms.

Keratoma palmare et plantare.—NADEL²⁶ reviews the literature of this disease very thoroughly and points out that somewhat similar conditions have been described under various names. He then describes the changes seen in a nine-year-old boy of Lemberg in whom the abnormalities were first noticed two months after birth. The palms showed well-defined patches of marked hyperkeratosis, real horny masses. The soles were covered with a thick brownish layer of hyperkeratosis with deep fissures, the horny plateaux ending abruptly at the edges of the soles. They were surrounded, however, by a bluish-red area of 2 cm. diameter. The nails of the hand were thickened, but those of the toes were thinner than normal. In spite of the horny thickening there was marked hyperidrosis of the feet. Patches of thickened and fissured skin were also present at the right angle of the mouth and over the coccyx. Inside the right cheek were small sheets of leucoplakia. Musculature was generally atrophic, particularly in the legs and was apparently due to disuse. Teeth were normal but hair was somewhat scanty. Clubbing of the fingers and chronic bronchitis were also present. Radiography revealed thinning of the skull bones and calcification of the foot joints. Intelligence was only that of a child of four. This case therefore combines all the features of those previously described by Unna, Thost, Jadassohn and Lewandowsky.

²⁵ SULZBERGER (Marion B.) & KAMINSTEIN (I.). Avian Itch Mites as a Cause of Human Dermatoses. Canary Birds' Mites responsible for Two Groups of Cases in New York.—*Arch. Dermat. & Syph.* 1936. Jan. Vol. 33. No. 1. pp. 60-71. With 1 fig. [24 refs.]

²⁶ NADEL (A.). *Keratoma palmare et plantare atypicum*.—*Arch. f. Dermat. u. Syph.* 1936. July 13. Vol. 174. No. 4. pp. 404-412. With 6 figs.

Pityriasis rubra benigna.—A definite syndrome has been observed by MAPLESTONE and GHOSH²⁷ in 100 cases. It is characterized by the patchy distribution of erythema, exfoliation and itching. Because fatalities are rare the above name is proposed by the authors. At the same time they point out that Crocker recognized this type but that references to it are absent from modern literature. The erythema is intense and acute whilst the exfoliation of fine scales is continuous. Patients are otherwise healthy but soon begin to suffer from inadequate rest and malnutrition. When the chronic stage is reached some lichenification and pigmentation appear. It is usual to find that the flexures of the knees, elbows and neck are affected, which areas may relapse year after year during the summer months. No aetiology has been discovered but allergy seemed to play a part in 23 cases. The patients were mostly males between the ages of 20 and 40. Local remedies were confined to symptomatic treatment whilst the internal administration of arsenic and antimony and non-specific protein shock seemed to help.

Lupus erythematosus.—This disease is less common among negroes than it is among whites. CUMMER²⁸ describes a case in a negro and suggests that the relative rarity of the condition may be explained by the fact that deeper pigmentation protects against the sun's rays. He also mentions that the incidence of tuberculosis is greater among negroes, and so concludes that there is either no relationship between the two diseases or that the pigment protects the skin in spite of the greater susceptibility to tuberculosis. In considering this question of sunlight reference must be made to SPIES²⁹ article in the *Archives of Internal Medicine*. In it he discusses pellagrous dermatitis and demonstrates that this is really a deficiency disease, by no means limited to the tropics.

Acanthosis nigricans.—STRANDELL³⁰ has treated two cases of this disease in Sweden by means of intragluteal injections of a highly active liver preparation, Heptomin. On an average 4 cc. are administered each week either as a single or in two injections. In both cases there occurred definite decrease in the pigmentation and a lessening of the papillomatosis as well as a marked improvement of the concurrent anaemia.

Sydney Thomson.

²⁷ MAPLESTONE (P. A.) & GHOSH (L. M.). A Study of One Hundred Cases of Dermatitis.—*Indian Med. Gaz* 1936. Aug. Vol. 71. No. 8. pp. 451-458. With 6 figs.

²⁸ CUMMER (Clyde L.). Etiology of Lupus Erythematosus: Occurrence in the Negro.—*Arch. Dermat. & Syph.* 1936. Mar. Vol. 33. No. 3. pp. 434-443. With 4 figs. [18 refs]

²⁹ SPIES (Tom D.). Relationship of Pellagrous Dermatitis to Sunlight.—*Arch. Intern. Med.* 1935. Nov. Vol 56 No 5. pp. 920-926. With 3 figs.

³⁰ STRANDELL (Birger). Acanthosis nigricans—Besserung nach Leberinjektionen.—*Acta Med. Scandinavica*. 1936. Vol. 87. No. 5-6. pp. 551-556. With 4 figs.

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PELLAGRA : THEORIES OF CAUSATION.

A CRITICAL REVIEW.

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Pellagra is a rare disease in Great Britain and seldom mentioned until recent years, when it has become the custom in dealing with so-called deficiency diseases to make some brief reference to the condition. In those countries, however, in which it has been endemic, pellagra has excited a great deal of attention and study, and it would be difficult to find any other malady in the whole realm of morbid conditions concerning which so many theories have been propounded. To enumerate them would be to recount the advances in medical thought, and one might add fashion, during two centuries, from miasm to monophagism, from vicious humours to avitaminosis and ultra-microscopic virus.

GHERARDINI writing on pellagra in 1780, quoted by H. F. HARRIS (1919)*, remarked "All things may be established theoretically. Error itself may be proved; this is an undeniable axiom, which is particularly true of medicine. The majority of physicians have ever preferred with an appearance of belief, the effulgent chimeras of their fancy to the wise teachings of nature. Piling conclusion on conclusion, they, with cunning art, explore the boundless realms of theoretical medicine, and soaring to their hearts' content, prefer the vainglory of having advanced an hypothesis to slow and painful investigation, particularly as in the primrose pathway of theory they find no difficulties which interfere with their conclusions." Other authors of more recent times have been inspired, in similar phraseology, to hurl sarcastic criticism upon those who have ventured to theorize upon the causation of pellagra.

F. M. SANDWITH remarked "The field of pellagrous aetiology has been the playground of fledglings whose intellectual judgment is befuddled because they have no real comprehension of the fundamental

References marked * are given in bibliography, this *Bulletin*, 1936, Vol. 33, pp. 897-901.

question and, therefore, attempt to introduce into the aetiology of pellagra all sorts of things from bald banalities to the most wonderful fantasies."

A. D. BIGLAND (1920)* in thus quoting SANDWICH, intimated that these words should never be forgotten by those who would enter this field of discussion. They are the more pointed as some of SANDWICH's teachings have since been found to need modification. SANDWICH for example was responsible for writing (1898) "In no case can pellagra be accurately diagnosed unless the man comes from a country where maize is a staple article of diet," a dictum now recognized as untrue.

BIGLAND, after quoting SANDWICH, went on to say "for some years I have thought the only way to discover the cause of a disease like pellagra was to make, as it were, an arm-chair study of all the cases the world over. The question will then resolve itself into a review of the similarities and dissimilarities presented by the various outbreaks, with the hope that in the end the research may reveal a factor common to all." Some such idea had occurred to the present writer and as a result of a study extending over many years there have emerged a few fairly definite impressions, some of which will here be discussed, firstly the theories of causation of pellagra and secondly theories concerning the pathogenesis of some of the symptoms.

The majority of those who have written upon the subject have based their theories in regard to causation upon observations limited to some one group of cases, under certain local conditions. They have often ignored the findings of others or treated them with not always polite contempt. Cases of the disease which did not fit some particular theory were either gently left out of the picture or conveniently elevated to the rank of pseudopellagra, para-pellagra, alcoholic pellagra, secondary pellagra, etc.

On the other hand, a study of these exceptional cases, those that have not fitted into the theory of the moment, should go a long way towards suggesting the key to the whole problem.

Many of the theories of the past probably contain truths in so far as they may be regarded as factors of aetiological importance, always bearing in mind the necessity of putting oneself in the place of the author when interpreting his writings.

In venturing to put forward, from an armchair, any ideas concerning the causation of pellagra, an attempt will be made to explain some of the known facts concerning that disease and at the same time to correlate the theories of others, no one of which has ever received general acceptance.

The many theories will not be set out in a list but merely alluded to as occasion arises. Many will require but a short reference, others will need more attention, including two as representative of medical opinion of to-day—the one which suggests that pellagra is due to a deficiency of "protein of high biological value" in the diet, the second which suggests that it is an avitaminosis.

During the years which have elapsed since CASTLE and his colleagues enunciated their theory to explain the pathogeny of pernicious anaemia, a similar pathogeny has been suggested for a number of other conditions including first, sub-acute combined degeneration of the cord, then some other forms of anaemia and lastly what has been called by A. H. DOUTHWAITE (1936) gastrogenous polyneuritis. It seems possible that the underlying principle will be found to have a still wider application.

A number of observers have, of course, remarked some of the resemblances between pellagra and pernicious anaemia. That some faulty reaction, such as is believed to occur in pernicious anaemia and these other conditions, may take place in pellagra must have crossed the minds of many of them.

In the discussion which follows it is proposed to examine the problem of pellagra in the light of such an hypothesis, an exercise which, as far as I am aware, has never been undertaken.

That the "*fons et origo mali (pellagrae)*" is located in the stomach is suggested by the many analogies with pernicious anaemia, etc.

In these several conditions and pellagra we see linked together in various combinations disturbances in function of the haemopoietic system and the nervous system associated with chronic gastritis and failure of the normal secretion of hydrochloric acid by the stomach as if the hand of chronic gastritis struck different chords on the keyboard of gastric secretion.

But whereas in pernicious anaemia the fault is considered to lie in a defective secretion of the intrinsic factor by the "pyloric gland organ" as E. MEULENGRACHT (1935) calls it, in pellagra it is here suggested there may be default of one or other or both intrinsic and extrinsic factors (to be referred to as P.I.F. and P.E.F.).

In endemic pellagra both factors are probably involved, in sporadic pellagra a failure of P.I.F. may play the more important part.

At the present time both the current theories postulate a deficiency state; in the one, so stoutly defended by W. H. WILSON (1918, 1921,* 1930) a deficiency of protein of "high biological value," in the other an avitaminosis. In the latter the lack of vitamin alone is presumed to cause the disease, or the symptoms of the malady are supposed to be caused by an hypothetical toxamin, as suggested by E. MELLANBY (1934), derived from grain, which in the absence of the vitamin is not neutralized. Neither of these theories would appear to cover all the ground as has been shown by the arguments advanced by their respective adherents against their opponents.

While it is admitted that endemic pellagra is associated with an ill-balanced monotonous diet consisting principally of grain, with a minimum of those substances which contain so-called protein of high biological value, and a full vitamin content, the fact that large native populations in Africa and elsewhere subsist on similar diets without developing pellagra is generally lost sight of and left unexplained.

When J. GOLDBERGER* put forward his thesis of a food deficiency and postulated his P.P. factor in the prevention of pellagra, he was, it is suggested, only half-way towards reaching the truth. This P.P. factor was later referred to in America as Vitamin G, and by some identified with Vitamin B₂.

Since then, however, what is now referred to as the Vitamin B complex has been split up, on the basis of experimental reactions in animals, into no less than ten hypothetical factors concerning which very little is known.

All that can be claimed to date is that certain food substances appear to contain elements which are of use in the prevention and treatment of pellagra.

Many such substances contain protein of high biological value and B vitamins as they have in turn been defined, but these same food substances might be equally well looked upon as containing P.E.F., some

indeed might contain the anti-pellagra factor complete as will be mentioned later.

A complete withdrawal of P.P. factor from the diet should cause pellagra in all those so deprived according to GOLDBERGER's theory, but only six of the eleven convict volunteers of his experiment showed signs of the disease. As so often occurs in experimental work, the failures are left unexplained. Pellagra may occur in those who partake of a normal adequate diet. Their numbers are small it is true, as J. T. MARTIN (1931) pointed out, less than 4 per cent. of the cases of pellagra in the United States occur among the well-to-do classes. In endemic areas where pellagra has a high incidence, some members of a family develop pellagra, others are spared, though all live under the same conditions and take the same diet. R. FLINKER (1934) found that, in the Bukowina, pellagra broke out among those taking a good mixed diet and cleared up without any change of diet, and that the disease occurred in those who had lived for many years in endemic areas without change of conditions. He suggests the cause then lies in some digestive disturbance with achlorhydria. Pellagra will attack inmates of an asylum who have been living under unchanged conditions for years. A single extrinsic pellagra preventive factor will not account for such cases. Attempts have been made to explain some of these facts by supposing that there is malabsorption of the P.P. factor, but there is no evidence of this. The fact that substances containing P.P. factor will cure a condition produced by experimental deprivation of the same substances is no proof that P.P. factor will cure pellagra. R. H. TURNER (1931)* remarked that, in spite of special treatment based upon the knowledge gained by GOLDBERGER's work, death occurred in 25 per cent. of pellagrins admitted to the hospital in New Orleans in their first attack. F. P. UNDERHILL (1932) agrees: "Vitamin G therapy has made a poor show!"

These and other facts lead to the conclusion that there may be a P.I.F. as well as a P.E.F.

T. R. BOGGS & P. PADGET (1932)* believe in the identity of Vitamin G on account of the results obtained with liver therapy. Of patients to whom liver was administered, 25 recovered and 7 died; of those from whom liver was withheld, 26 recovered and 24 died. These figures, however, prove nothing about any particular vitamin. Forty of a series of one hundred and two cases were due to alcohol, and they suggest that alcohol destroys the P.P. factor in the gastrointestinal tract, thereby preventing proper absorption.

G. A. WHEELER & W. H. SEBRELL (1932) had already shown that liver was rich in a pellagra-preventing factor.

BOGGS & PADGET found liver extract of no value in treatment; on the other hand R. L. RAMSDELL & W. H. MAGNESS (1933) speak of the spectacular results obtained in 22 cases of pellagra treated with 2 cc. doses of liver extract No. 343 injected intramuscularly. The results of treatment will be referred to again later. So far, it is only fair to argue, from the results of treatment, that a number of food substances contain some one or more principles which are useful in treating the disease. The fact that particular liver extracts are of therapeutic use suggests that the anti-pellagra factor is stored in the liver. Two points may be emphasized here in attempting to evaluate any particular treatment. The first is, what signs shall be taken as evidence of improvement; the second, how shall it be proved that the improvement is due to the treatment. As has already been mentioned,

the exanthem may clear up while the patient is progressing towards death. The exanthem and other symptoms may run a self-limited course and their retrogression be wrongly attributed to the particular treatment given.

To summarize this part of the argument : endemic pellagra is commonly associated with an ill-balanced diet deficient in substances containing protein of high biological value and the hypothetical P.P. factor (vitamin G), but this association is not invariable in either direction. Whatever the extrinsic factor may be, there is reason to believe that a second factor may be involved.

The evidence for postulating a second factor of the nature of an intrinsic factor, analogous to haemopoietin, and for believing that failure in its secretion is associated with chronic gastritis will now be discussed.

Practically all the causes of chronic gastritis, as put forward by Knud FABER (1935), figure in the history of pellagra including on the one hand noxious substances taken by mouth ; alcohol, tea, coffee, curry and condiments, coarse vegetables, decomposed foods, associated in many cases with the habits of bolting food and overloading the stomach, and on the other hand causes of haematogenous origin : febrile diseases, acute and chronic infections, including among them pulmonary tuberculosis.

ZANETTI (1778)* believed that bad food and bad water were aetiological agencies ; sufferers from the disease were chiefly the very poor who could only afford the poorest food.

GHERARDINI (1780) also considered bad food, and especially bad maize, as the chief cause of the malady. FRAPOLLI (1771)* added bad vegetables and called attention to the relationship of rancid butter and oils with pellagra. He found that the disease was particularly common in dyspeptics. STRAMBIO (1789)* also alluded to bad food including maize and rancid oils and laid stress on all depressing influences.

W. X. JANSEN (1788) remarked bad foods and mouldy cereals. L. SOLER (1791) considered the disease to be due to inanition as the consequence of misery and filth. G. CERRI (1792) also referred to inanition. THOUVENEL (1797) pointed out that pellagra was common in areas where the maize did not mature properly. F. L. FANZAGO (1807) and G. B. MARZARI (1810) were whole-hearted supporters of the maize theory followed, it should be remembered, by GUERRESCHI (1814), who believed a maize fungus to be the cause, and by L. BALARDINI (1845) who also urged mouldy maize as the chief aetiological factor in pellagra and T. ROUSSEL (1845) who held the same view.

C. LOMBROSO (1870) in his well-known treatise maintained the causal relationship of bad maize to pellagra. J. B. CALMARZA (1870) writing from Spain viewed pellagra as a disease produced by misery and alcohol. S. NOBILI (1841) noted the abuse of wine, as others have done since. H. F. HARRIS (1919)* was convinced that dyspeptic disturbances played a big part and that mental anguish as noted since the time of STRAMBIO was an important factor.

Thus we see mentioned in the observations of the older writers many of the more important aetiological factors in the production of chronic gastritis. All the theories which advocated some organism associated with maize as the specific cause of pellagra are, it is here suggested, no more than evidence of the use of bad grain. Such were the *Bacterium maydis*, Majocchi (1881) ; *aspergillus*, Ceni (1902) ;

streptothrix, Fossati, (1904); *streptobacillus*, Tizzoni, (1908); etc. The Illinois State Commission came to the conclusion that the disease was due to an infection unknown, but these and the more recent theories of infection, such as those of J. W. JOBLING and L. ARNOLD (1923), a fluorescent fungus of the *aspergillus glaucus-repens* group, of W. SUSMAN (1927) and of B. R. TUCKER (1935) who suggested a virus, fail to explain the facts and have received no support.

Specific maize theories, in one form or another, held the field over a very long period but it is worthy of note that maize was eaten in the endemic areas of Italy for the most part in the form of "polenta," referred to by many writers as a badly prepared and ill-cooked dish. In other areas maize meal was made up into an unleavened heavy acid bread. In more recent times a similarly indigestible diet was to be found in the endemic areas of the United States—corn-mush which is practically identical with polenta, corn-bread and hoe cake, which are never properly cooked, salted hog-meat, pork fat and molasses.

In these facts we see potent factors in the causation of gastritis, which come into play with greatest intensity during the winter months. Thus may be explained the seasonal incidence of the dyspeptic symptoms which have been so commonly elicited in the histories of pellagrins.

Despite ALPAGO-NOVELLO's (1894)* naive remark—"One thing which has infinitely displeased me is to read in a certain report that some individuals presenting evident symptoms of pellagra did not use maize" and such *ex cathedra* statements as that made by H. B. DAY (1930) who said "Pellagra stands to maize as beri-beri to rice," the time has arrived when pellagra should be freed from the maize millstone which has hung about its neck for so many years. The eating of maize by white races has connoted poverty and, it is here suggested, nothing else. The theories which postulated maize as the one specific cause of pellagra fell to the ground in 1910 when H. S. STANNUS (1912; 1913)* demonstrated an outbreak of classical pellagra among central African natives living on a diet of rice and beans. Yet H. F. HARRIS (1919)* referring to these observations in his monograph refused to believe the facts as they did not fit in with the maize theory of which he was a staunch advocate. Even as lately as 1932 Miss H. CHICK (1933) in the Lamar Lecture, still upheld the old maize theory and went so far as to suggest that "the toxic substance in maize is transferred to corn-whisky" in order to account for the cases of alcoholic pellagra in America, while ignoring the fact that other forms of alcohol may appear as aetiological factors in the disease. Alcohol acts as a potent cause of gastritis, as a cause of pellagra it will be discussed later.

No one of those who have upheld any of the maize theories has ever offered any explanation of the fact that among many native races, whose staple diet is maize, pellagra is absent or very rare. The reason is obvious if the methods of preparation of these foodstuffs by natives be studied. The preparation of flour from maize by natives is a most elaborate and laborious process, carefully carried out, the final product being free from those qualities which have been adversely criticized in polenta. The same is true of other native flours such as that made from cassava. If, on the other hand, some ill-prepared maize product be given to children, such as was the case in the disease described by Miss C. WILLIAMS (1933, 1935)* one would expect severe gastritis to result. The same would be true of children fed on cassava food mentioned by D. G. Fitzgerald MOORE (1934)*. Even a change from

native-prepared maize flour to steam-milled maize will cause gastrointestinal upset in natives; this being probably the explanation of the outbreak (of pellagra) in Northern Rhodesia described by P. A. NIGHTINGALE (1912)* as Zeism.

The part played by infections is suggested by a large number of observations. BABES (1910) remarked syphilis and malaria as predisposing causes; the French had noted the association of pellagra with any disease producing cachexia.

In warmer climates parasitic infestations play an even more important part. F. M. SANDWICH (1898)* and others have called attention to the association of pellagra in Egypt with hookworm infections. LONG (1910) put forward a pellagra theory based on the high incidence of amoebic infections in his cases. A. FAKHRY (1932)* showed that 92.3 per cent. of 178 pellagrins attending the ankylostome hospital in Cairo, were infected with *Schistosoma mansoni*, this being double the incidence of the infection in non-pellagrins. A. G. BIGGAM and P. GHALIOUNGUI (1933)* found bowel parasites in 24 of 25 cases investigated. Helminth, flagellate and chronic dysenteric infections were common among the Turkish prisoners of war before referred to. They were common in the Nyasaland cases. All these infections, it is here suggested, are common causes of chronic gastritis in native races, and therefore of aetiological significance when the other factors in causation come into play.

Some elements common in native dietaries may also play a part, such as salt-fish, highly seasoned and spiced foods, some oils, sour dishes, vinegar, etc., possibly tea and coffee, as noted in the histories of outbreaks of pellagra and pellagra-like conditions in Africa and in the East. Sugar-cane products may also possibly be incriminated. R. BLOSSER (1915) remarked that pellagrins recovered after cane-sugar, syrup and molasses, commonly taken in considerable quantities, were excluded from the diet. The central neuritis described by H. H. SCOTT (1918) in Jamaica was associated with an almost exclusive diet of cane. There is also the interesting fact in experimental work recorded by V. R. LEADER (1930). He found it was impossible to produce the pellagra-like condition in rats by special feeding if cane-sugar were excluded from the diet, and that the addition of cane-sugar to the deficient diet precipitated the onset of the condition. AYKROYD on the other hand succeeded but it should be noted that the corn starch which was used had been dextrinized by boiling.

All the several causes of chronic gastritis therefore figure commonly in the histories of pellagrins in all parts of the world. As HARRIS has emphasized, practically all pellagrins give a history of dyspepsia, and as HENNING says "Every dyspeptic suffers from gastritis."

One of the commonest results of chronic gastritis is failure in the secretion of hydrochloric acid. Hypochlorhydria occurs in a very large percentage of cases of pellagra and complete anacidity in the majority. The condition was first observed by LOMBROSO.

One or two points in the relationship of pellagra to achlorhydria are worthy of note. In an ordinary population failure in acid secretion is progressively more common in each successive decade, it occurs in a greater proportion of females and at an earlier age in that sex, and gastric acidity is lowered during pregnancy. The higher incidence of pellagra in the female has often been remarked and that it attacks women at an earlier age has been known since the time of CALDERINI (1844). That women were liable to develop pellagra during lactation

was first noted by STRAMBIO, while ALDALLI called attention to woman's susceptibility to the disease at the menopause.

Chronic gastritis with resulting failure of gastric acid secretion and achylia gastrica may not be uncommon among native races as shown by C. D. de LANGEN (1932-3) in the Dutch East Indies and yet pellagra is rare among them just as is pernicious anaemia. DE LANGEN had seen no case of the latter in Batavia and it will be recalled that no case was forthcoming when Miss L. WILLS (1935) was working on anaemia in Bombay.

On the other hand, as is true of beriberi and scurvy, pellagra and pellagra-like conditions appear prone to attack natives when confined in institutions, witness the outbreaks in the prisons of Africa, Malaya, etc., referred to in a previous article, facts which suggest that the metabolic equilibrium of these peoples is unstable. The added stress of manual labour with fatigue and mental depression may well be "the last straw" in upsetting the balance and precipitating an attack of pellagra, as was noted by the older writers ZANETTI, ODOARDI, ALBERA and STRAMBIO.

To H. DUDGEON of Egypt is attributed the saying "once a pellagrin always a pellagrin." He considers that pellagra is not caused by a specific dietetic deficiency, that while the latent pellagrin may be maintained in health on a sufficient diet, any defect in diet or failure in health will be followed by the development of symptoms of the disease. Others recognizing the same fact have spoken of a pellagrous diathesis; but are such cases anything more than examples of unstable equilibrium? Others have remarked the effect of an operation with ether anaesthesia or the exhibition of a purge in precipitating the attack of pellagra. N. L. CORKILL's (1934)* observations concerning snake-bite in producing an attack of pellagra have a similar bearing. These exciting causes may determine the extinction of an already failing secretion of a P.I.F.

The anaemia associated with pellagra is irregular in incidence. So far as published records go, no direct relationship has been established between the degree of anaemia and the severity of the disease, nor between the occurrence of anaemia and achylia or diarrhoea. We may recall in this connexion the fact that, as has been already mentioned, the condition may follow certain operations on the stomach.

The anaemia is also irregular in type—in most cases it is of moderate degree but it may be slight or marked, hypochromic or hyperchromic, with a varying colour index. The administration of any one specific therapeutic agent does not give uniform results.

The resemblances between pellagra and the hypochromic anaemia of Wits are of interest. In the latter, with an incidence chiefly in women of middle age, there are associated an atrophy and aphthous inflammation of the mucous membrane of the tongue and pharynx, cracks at the angles of the mouth, trophic changes of the skin, nails and hair, fatigability and not uncommonly diarrhoea, together with hypochlorhydria, achlorhydria or achylia, but haemopoietin is present.

In pellagra it was assumed that Castle's intrinsic factor was being secreted by the stomach. This has been demonstrated by T. D. SPIES and W. PAYNE (1933) and confirmed by M. SALAH (1935) using Singer's method with rats.

It will now be of interest, in view of the hypothesis which has been suggested, to examine those groups of cases referred to by writers as

sporadic, pseudo-pellagra, para-pellagra, alcoholic and secondary pellagra.

Sporadic cases of pellagra were first noted nearly a hundred years ago; they gave rise to a considerable amount of discussion. BAILLARGER (1847) was the first to recognize a pellagrous eruption in a lunatic, but it was E. BILLOD (1859, 1865)* who proved how commonly pellagra affected the inmates of asylums. He referred to the affection as "Pellagra of the Insane." T. ROUSELL (1866) introduced the term "Pseudo-pellagra" and M. H. LANDOUZY (1860) included, under the term "Sporadic pellagra," all those cases which did not fit into the maize theory of the endemic disease. LOMBROSO (1870), BELMONDO (1889) and VEDRANI (1905) would not accept alcoholic cases as true pellagra, and L. MERK (1911) would not recognize those cases associated with alcoholism, cachexia, or psychopathy. H. F. HARRIS (1919) too, an ardent supporter of the maize theory, put forward the term "para-pellagra" to cover all those cases. He speaks of alcoholic pellagra, the pellagra of misery, the pellagra of the insane, and in a fourth group places all those "cases to which the term pellagra has been loosely applied, but which are evidently of an entirely alien character." He sweeps, into this side-track, cases which had been recorded in this country, including the well-known cases of C. R. Box and the group of typical cases described by H. S. SIANNUS in Central Africa.

Pellagroid was another term invented with no good reason; pellagroid is pellagra as V. H. GOUGEROT and J. MEYER (1932)* have pointed out.

Pellagra associated with alcoholism.

In the more northern of the United States where alcoholic pellagra has been a not uncommon affection in more recent years, it is now recognized by competent observers to be one and the same disease as ordinary pellagra; "Alcoholic pseudo-pellagra is an anachronism" exclaims one writer. With few exceptions the 71 male and 29 female pellagrins admitted to hospital in Philadelphia and reported by J. V. KLAUDER and N. W. WINKELMAN (1928) were alcoholic cases. They appeared to view the affection as an intoxication caused by alcohol. In the discussion of their paper J. F. SCHAMBERG suggested that alcohol acted by disturbing digestion, and E. D. CRUTCHFIELD referred to the difficulty of nourishing the alcoholic. Isolated alcoholic cases have been recorded elsewhere, by K. GRUNENBERG (1923) in Berlin, by L. ARZT (1926) in Austria, by OLIVER and FINNERUD (1927), F. C. KNOWLES & J. B. LUDY (1926), and others.

The history in these cases is well illustrated in a case described by C. W. FINNERUD (1929): a 32-year-old negress after taking 1 to 2 pints of "moonshine" a day for 6 weeks and nothing to eat, developed diarrhoea, nervousness, sore tongue and mouth, erythema on the backs of the hands, wrists and forearms, tremor and incoherent speech, with loss of weight. A dozen such cases are admitted annually to Cook County Hospital. They recover in from 2 to 4 weeks when put on a full diet.

E. R. MALONEY (1929) has published similar histories. He has referred to 21 cases of "alcoholic pseudo-pellagra." Symptoms appeared after 2 to 6 weeks' heavy drinking of "green whisky" with little more than a plate of soup and a crust in the day. Two of the twenty-one patients had delirium tremens, the rest had no mental symptoms; half were constipated, half suffered from diarrhoea. The exanthem

was seen on the hands, sometimes on the face, but in these cases never on the feet. Recovery occurred in from 8 to 12 days.

S. R. MILLS (1934) has recorded twelve cases of pellagra with four deaths among seamen admitted to the Naval Hospital, League Island, Pa., following upon alcoholic debauches of several weeks' duration, when, beyond the boot-leg corn-whisky or synthetic gin, little had been taken by mouth except some oatmeal. In these cases the backs of the hands and wrists were the seat of the erythema; the tongue and oral mucous membrane were red and raw; diarrhoea was present and loss of weight had occurred; blood picture normal; achlorhydria present.

Of 14 cases admitted in seven years to the Boston Psychopathic Hospital under the care of R. H. GUTHRIE (1929) six were chronic alcoholics.

GATÉ, P. TIRAN and J. A. THÉVENON (1932) mention the case of a 38-year-old French woman "bargee" with typical pellagrous affection of the skin, of the hands, wrists, fingers, face and of the mucous membrane of the mouth and vagina in which there was a history of chronic alcoholism but no dietetic restriction or monotony.

Perhaps the most interesting series of cases, especially in view of the effects of treatment, are those reported by T. D. SPIES of Cleveland (1934, 1935). In a previous communication T. D. SPIES and H. F. DE WOLF (1933)* recorded the mortality among their pellagra cases as 54 per cent. when treated in hospital by care, diet and yeast. In the second series of 125 cases the mortality rate was reduced to 6 per cent. This was effected by even greater care in nursing in a special clinic, by scrupulous evaluation of the dietaries according to the needs of each case, by securing complete rest by means of sedatives and by the exhibition of one or more of the following preparations:

- (a) Dry yeast powder, 75 to 100 gm. *per diem* by mouth.
- (b) Liver extract 75 to 100 gm. *per diem* by mouth, or intravenously if necessary.
- (c) Desiccated hog's-stomach 200 gm. as above.
- (d) Wheat germ 250 to 300 gm.

Of these cases 95 per cent. had imbibed heavily and it was considered that the pellagra was secondary to failure of food ingestion. The symptoms found consisted in those of "central neuritis": confusion, disorientation, hallucination, dementia, mania, which varied day by day, from hour to hour; peripheral neuritis characterized by severe pain in feet, legs, and sometimes hands and arms; anaemia in 60, per cent., of which a third showed a low colour index and two-thirds a high colour index; erythema of skin and mucous membrane of mouth.

The authors add a note to the effect that "neurologic signs and symptoms of the two conditions (delirium tremens and pellagra following alcohol) are clinically indistinguishable in our series." Under the special treatment all symptoms respond, the skin lesions improve most rapidly, the symptoms of the central neuritis may recover after prolonged treatment, but it was not determined whether the peripheral neuritis was cured. A further interesting point and one of considerable importance was that 37 per cent. of cases relapsed when the treatment was discontinued.

The authors, as has been mentioned above, believed that pellagra supervened upon failure of food intake.

The facts, however, may be interpreted otherwise it is here suggested. Firstly, simple starvation for a few weeks will not result in pellagra ; secondly, alcohol is perhaps one of the most potent agents in causing gastritis and achylia ; may it not be a potent agent in inhibiting the secretion of a P.I.F. ? In the acute alcoholism, such as is depicted by American writers, we should expect the inhibition of secretion of P.I.F. associated with complete withdrawal of P.E.F. to cause pellagra. The suppression of P.I.F. might be temporary or permanent. In the former case recovery would be possible, in the latter not possible. The results obtained by treatment as detailed above appear to add weight to this argument, the large doses of hog's stomach, liver extract, etc., would contain, according to the hypothesis put forward, considerable amounts of the anti-pellagra factor complete ; when these were discontinued many patients relapsed. In some cases of acute alcoholism and in other cases of chronic alcoholism the power to secrete P.I.F. may be permanently lost.

These cases of alcoholic pellagra therefore appear to throw light on the general problem.

Pellagra due to voluntary restriction of diet.

S. A. MUNFORD (1930) records the case of a 38-year-old woman, who following a faddist cult, lived on raw carrot, beef, artichoke, celery, lettuce, grapefruit, alligator pears, and crackers [biscuits] for four months and then for two months on a still more restricted diet. She developed dermatitis, diarrhoea, anaemia and mental apathy but recovered on forced feeding.

W. H. MOOK and R. S. WEISS (1925) have reported the case of a 19-year-old girl, 6 ft. 1 in. tall, who, in order to reduce her weight, limited her diet to carbohydrate and some pork product. She came under observation weighing only 71 lb. The symptoms were red swollen tongue and gums, a glove dermatitis and pigmentation over the knees and elbows, loss of appetite, extreme atonia and diarrhoea. Gastric acid was present and there was no anaemia. Recovery took place on a protein diet. R. W. BRACE (1929) cites a similar case, the diet consisted of carbohydrate, a little milk, little meat and no vegetable. P. S. CARLEY (1928) mentions the case of a 33-year-old woman who on account of indigestion and fear of cancer lived on practically nothing but cooked cereals. The pellagrous symptoms cleared up in two weeks with full diet and yeast. S. R. ROBERTS (1929)* notes a case of pellagra in a 64-year-old woman who for 40 years had taken an excess of candies [sweets], sweet preserves and bread, but no meat, milk or eggs and rarely vegetables.

The Danish labourer described by J. E. HOLST (1935) who developed pellagra, but no gastro-intestinal disturbance and no achylia, on a diet of bread, margarine and coffee, is another example of sporadic pellagra due to dietetic restriction.

R. H. GUTHRIE (1930), A. E. GREER (1930) and N. P. WALKER and G. A. WHEELER (1931), have witnessed the development of the pellagrous dermatitis in patients following a ketogenic diet. Seale HARRIS in the discussion on a paper by DEARMAN (1928) said he had seen pellagra develop in a tuberculous diabetic on a reduced diet but high in carbohydrate.

These would appear to be cases in which, according to the hypothesis here advocated, the disease depended entirely, or practically entirely,

on a deficiency of P.E.F., though in some of them there may well have been an associated gastritis with loss of P.I.F.

Pellagra in the Insane.

As is well known, pellagra may lead to insanity, the number of pellagrins in America who develop a psychosis being according to S. R. ROBERTS (1929)* about 10 per cent., but the insane are also prone to develop pellagra, as was realized in France long ago and in the United States since then, though the two facts have not always been clearly distinguished.

The point of interest, one to which attention is not called as a rule, is that only some of the inmates in any particular institution fall victims to pellagra. GOLDBERGER found that in certain asylums in the United States the number of lunatics developing pellagra each year was a constant proportion of the total.

He held that in the American institutions, prevention could be attained by giving foodstuffs such as protein, tomato juice or yeast vitamin in the form of Harris's Powder, a substance containing very little protein nitrogen. Inasmuch as Goldberger found them useful he spoke of them as containing P. P. factor, but this does not explain very much.

In this country before 1913, pellagra appears to have been unnoticed in our asylums. In the period 1913-1928 there were 108 deaths among asylum inmates. G. A. WATSON (1923)* reporting upon the cases at the Lancashire County Mental Hospital, Rainhill, stated that in some the disease was present on admission but that the majority of patients had been resident in the institution from six months to several years and one case for twenty-seven years. The majority were women between forty and fifty years of age. Of the diet it is stated that it was more generous and more varied, especially in regard to protein, in the year of the outbreak than in previous years. This, of course, is not synonymous with saying that a liberal amount of protein was ingested and absorbed. The age and sex incidence does, however, suggest that some disturbance of function was involved. May it not have been chronic gastritis, achlorhydria and a deficiency of P.I.F.?

Gastric disturbances and gastritis are of course common in psychotics: it was noted by Watson at Cane Hill and more recently has been remarked by A. HOFMAN-BANG (1933) in all his pellagrins in Danish asylums.

Secondary Pellagra.

Fifty eight published cases of so-called secondary pellagra have been collected. Others may not have been recorded and some probably have escaped recognition. In nearly all, the disease has been associated with an organic lesion in the gastro-intestinal tract:—Oesophageal stricture, P. A. O'LEARY (1926); carcinoma of the cardiac orifice, F. W. ROLPH (1916); carcinoma of stomach, R. C. BRYAN (1919), BERON (1931), J. V. KLAUDER & N. W. WINKELMAN (1928); carcinoma of the pylorus, 2 cases, W. L. BENDER (1925), P. A. O'LEARY (1926), G. B. EUSTERMAN & P. A. O'LEARY (1931), S. TAKAHASHI (1929)*; carcinoma of the alimentary tract, 4 cases, A. J. WYJASNOWSKY (1934)*; pyloric ulcer, W. L. BENDER (1925), 2 cases, P. F. O'LEARY (1926); pyloric stenosis, A. MEYER (1932); duodenal ulcer, S. Levy SIMPSON (1935); operation for supposed

gastric ulcer, 3 cases, M. L. GRAVES (1920) ; duodenal feeding, 2 cases, W. C. SANDY (1919), 2 cases, T. E. H. THAYSEN (1932)* ; gumma of stomach, R. H. TURNER (1929) ; carcinoma of the head of the pancreas, I. MURRAY (1936) ; carcinoma of the lower ileum, 2 cases, F. R. NUZUM (1925) ; stricture of the jejunum and ileo-caecal valve, R. H. TURNER (1929) ; tuberculous entero-colitis, R. W. B. ELLIS (1930) ; tuberculosis of the bowel, O. R. LANGWORTHY (1931), YANG & HU (1930)* ; carcinoma of the transverse colon, A. R. ELLIOTT (1927) ; carcinoma of the descending colon, P. A. O'LEARY (1926) ; ulceration of the colon, YANG & HU (1930)* ; colitis, J. M. BARNES (1925) ; poradenitic stricture of the rectum (*Lymphogranuloma inguinale*) 7 cases, E. VON HAAM & L. LICHTENSTEIN (1935) ; rectal stricture (almost certainly of the same nature) 8 cases, R. H. TURNER (1929) ; rectal ulceration and polyposis, YANG & HU (1930)* ; recto-vaginal fistula, A. C. LAMBERT (1927)* (both also probably due to poradenitis) ; suppurating hydatid of the liver, C. E. CORLETTE (1924) ; multilobular cirrhosis of the liver, F. LANZARINI (1924) ; diaphragmatic hernia, M. B. STRAUSS (1934).

In many of the gastric cases cited operation was undertaken and in this regard they are of interest in that pernicious anaemia may similarly follow operation upon the stomach, the explanation lying, according to A. F. HURST (1923), in the artificially induced gastritis and achylia. Similar cases, fifteen in number, are cited from the literature by R. A. ROLANDS and S. Levy SIMPSON (1932) who added two further cases of pernicious anaemia and subacute combined degeneration following gastrectomy and post-operative gastritis.

Pernicious anaemia may also be associated with stricture of the small intestine often tuberculous in nature, as reported by K. FABER (1895) and by A. F. HURST (1933). The same association with stricture has also been noted by E. MEULENGRACHT (1929), by J. C. HAWKESLEY & E. MEULENGRACHT (1936) and by M. B. STRAUSS (1934) who has also seen pernicious anaemia develop after multiple intestinal anastomoses. HURST has also referred to cases associated with simple or malignant strictures of the colon.

ROLANDS and Levy SIMPSON found that the anaemias developing after operations upon the stomach might be hyperchromic or hypochromic, that they bore no direct relationship with gastric acid secretion, the rate the stomach emptied, the presence of diarrhoea or the intestinal flora. S. J. HARTFALL (1934) found that the degree of anaemia may be as marked after gastro-enterostomy as after partial gastrectomy, but that it is more common when the duodenum is occluded and gastro-jejunostomy has been performed.

These remarks apply in much the same way to the series of cases of secondary pellagra cited above, among whom anaemia also occurred in some proportion.

Hypochlorhydria, achlorhydria and achylia, deficient nourishment, vomiting, diarrhoea, operation upon the stomach and multiple anastomoses, continued duodenal tube feeding are all noted in the histories of these cases with varying incidence. No one of these factors is invariable and no exact generalization can be made.

The parallelism of these two series of cases is, however, worthy of remark and it is suggested that gastritis is the one common factor to all.

It would appear that in gastritis the stress of the pathological process may fall with unequal incidence upon the cells associated with the

secretion of a number of specific factors necessary to the normal metabolism of the body; in one case pernicious anaemia results, in another a hypochromic anaemia, in others subacute combined degeneration, pellagra, etc. In many cases more than one factor is involved and in a considerable proportion the secretion of hydrochloric acid is affected.

These cases of secondary pellagra appear to support the hypothesis that in pellagra there may be a default in an intrinsic factor.

Turning now to the pathogenesis of some of the symptoms in pellagra, the first to be discussed will be the dermatitis.

In a previous article the distribution of the exanthem in the attack of pellagra has been described. It was shown that the commonly accepted theory, which would explain the erythema as due to sunlight acting upon exposed areas of skin rendered sensitive by some photosensitizing toxin circulating in the blood, was untenable. Emphasis is again laid on this point as it is still the common habit to speak of pellagra as if light hypersensitivity were the one essential factor in the production of skin lesions.

The facts in regard to the distribution of the exanthem in pellagra may be stated, in reality, quite simply though they appear to have escaped the observation of most pellagrologists. The exanthem tends to appear in those areas of skin which, in any particular individual, have *undergone certain changes* as the result of the action in the past of traumata of various kinds including solar radiation, exposure to cold, friction, pressure, irritants, etc. This of course is true of the skin lesions in other diseases, as exemplified in variola, rosacea, etc., the distribution of the pigmentation in steatorrhea will also be called to mind.

Sir Thomas LEWIS in his monograph "The Blood Vessels of the Human Skin and their Responses" (1927) has shown that any noxious stimulus, of whatever kind, applied to the skin results in the liberation from the skin cells of what he called H-substance (since identified as histamine) which acts directly upon the minutest blood vessels of the skin in the neighbourhood and causes them to dilate. If the local concentration of histamine be large, stimulation of the sensory nerves may occur with the production, through the axon reflex, of dilatation of the larger arterioles. The release of histamine suddenly and in quantity, and especially if its action be prolonged, increases the permeability of the small vessels and if the damage be extreme rupture of these injured dilated vessels may occur with the production of a haemorrhagic reaction. If the reaction be less severe, as in ordinary sunburn, erythema, oedema and later desquamation and pigmentation occur. If the noxious stimulus be constantly repeated there results a permanent loss of tone in these smallest vessels with persisting dilatation and a heightening of the skin colour in the affected areas may occur.

LEWIS points out that the areas of skin normally exhibiting this heightened colour are those uncovered according to the fashion of dress and therefore exposed to climatic variations. It has been demonstrated by counts made on the living subject that there is no fixed relationship between the actual *number* of blood vessels and the depth of the skin colour, but that on the other hand it varies directly with the *size* of the minute capillaries and venules. In the circumoral region, for instance, they are very small, whereas in the pink cheek and lobe of the ear they are much larger. The loss of tone and increase in

size of the minute vessels is progressive with age and is proportional to the degree of exposure, so that the gross enlargement may be seen not uncommonly in the skin of the cheeks and nose, on the backs of the hands and over a V-shaped area on the upper part of the chest in women in this country, sometimes with the formation of telangiectases.

The actual areas of skin which show these changes vary in different individuals, but as the result of long observations I think they may be written down definitely as the triangular areas of the cheeks, the bridge and sometimes the sides of the nose, the chin, the ears, some part of the forehead, the sides of the neck behind the sterno-mastoids with a prolongation up behind each ear and sometimes the neck in collarette-fashion with the V-shaped prolongation downwards over the sternum. The circumoral and circumocular regions and the throat are spared, though in some persons with a fullness between the eyebrow and eyelid this area is affected ; in some also an area below the lower lid may be included. The backs of the hands, the forearms to some extent, the wrists bracelet-fashion and the shins may also be affected. All these areas which may suffer some degree of exposure are areas in which heightening of skin colour and telangiectasis may be observed. They are areas in which chapping occurs as the result of climatic exposure. This point is of importance ; exposure to cold, wind, etc., is probably as potent a factor in causing these skin changes as sunlight, and the chapping of the wrists bracelet-fashion is worthy of note in connexion with the distribution of the exanthem in pellagra.

Noxious stimuli other than climatic exposure may produce similar results in the skin, tension, pressure, friction, any form of radiation, chemical irritants, etc.—well seen after exposure to X-rays, after prolonged exposure to heat and so on. The skin of the back of the hand in many people, as the part of the body probably most exposed to injury, shows very well the changes under discussion. LEWIS has demonstrated that the venules of the skin over the knuckles have less tone than those of the skin of the back of the hand, and these in turn less than those of the skin of the forearm, etc., a point of great interest in view of the particular affection of the knuckles and backs of the hands in pellagra.

Anything which ordinarily causes flushing of the skin will cause an intensification of the colour in these "areas of heightened colour" as above described. When a general vasodilatation in the skin occurs it is only apparent as a rule in those areas of skin in which vascular tone has been lost, elsewhere it is "concealed or unrevealed." LEWIS cites Darwin's observation that when the face and neck redden in blushing the whole body tingles and feels hot to the subject, a point of interest in connexion with "burning in the palms of the hands and soles of the feet," a symptom in pellagra referred to below.

An injection of histamine will induce flushing in isolated and distant parts of the skin which have suffered previous injury, thus illustrating the fact that differences of minute vessel tone may be concealed until sufficient strain is thrown upon them.

These facts suggest a possible explanation of the distribution and mechanism at work in the production of the acute exanthem in pellagra, namely that there may be liberated into the general blood stream at the time of the appearance of the exanthem some substance with a histamine-like action. While the general dilatation of minute blood vessels remains "unrevealed" the maximum effect would be witnessed in those areas of skin in which the blood vessels had lost their tone,

become dilated and permeable as the result of previous repeated traumata. The areas of skin affected in a classical case of pellagra correspond to those affected by exposure to climatic conditions. In the less common sites for the eruption similar changes may have been produced by noxious stimuli or trauma other than climatic exposure. Thus would be explained the affection of areas of skin liable to intertrigo, as beneath the breast and about the genitals; of the areas subjected to pressure such as the buttocks and knees; of the areas subject to friction about joints, over prominent veins, mucocutaneous junctions, etc. It would account for the bracelet-like involvement of the wrists, for the atypical distribution which may be seen in the infant, for the freedom of the face in veiled Turkish women and for the occurrence of the rash in typical distribution in those who have been bedridden for some long period. It would explain why the dermatitis of pellagra tends to appear each year, sometimes with ever increasing severity, at the same sites and also offer an explanation of the localization of the skin manifestations to the scrotum in the cases described by LANDOR & PALLISTER, all referred to in a previous article.

That the exanthem of pellagra is associated with the liberation of histamine there can be little doubt, that there is a general liberation of that substance into the blood stream seems unlikely. More probably what happens is a local liberation in areas of skin, already damaged as above mentioned, when some substance necessary for its normal metabolism falls below a given level.

This substance according to the hypothesis put forward is the antipellagra factor synthesized in the stomach. It is this interference with the normal metabolism of the skin which accounts for the fact that for some short period after the appearance of the dermatitis any part of the skin will react to a noxious stimulus with the production of a pellagra-like lesion but that later the same stimulus produces only a normal reaction.

A partial failure of this factor spread over a long period might give rise to the more chronic and more generalized skin changes already described.

The mechanism of the production of the affections of the mucous membranes as seen in the mouth, etc., is certainly of similar nature to that operating in the case of the skin, though this is not apparently generally recognized. The part played by the ingestion of hot condiments and rough food-stuffs, referred to by some writers, is not without interest in this connexion, as exciting cases of stomatitis in pellagra.

The diarrhoea, like the sialorrhoea, is secondary to the affection of the mucous membranes.

A number of references have already been made to the common symptom in pellagra—"burning of the soles of the feet and palms of the hands," and it has already been suggested on clinical grounds that this symptom is not a manifestation of a peripheral neuritis as has been commonly inferred by many writers.

Though this burning pain is most commonly remarked in the soles of the feet and less often in the palms of the hands, it may also be felt in areas of skin affected by the exanthem preceding or accompanying the erythema; more rarely it occurs in skin unaffected by the rash and may be felt all over the body. Burning pain, which would appear to be on an exact parallel, is again a common symptom referred to the mouth and pharynx, while a characteristic burning pain in the stomach is often complained of. This distribution again suggests that there is

some underlying general cause and that localization depends on some local condition. It would appear possible that it is the specialized texture and particular anatomical formation of the skin of these parts which determines the localization of the symptom to the palms and soles.

In both situations the skin has a special development to withstand pressure, both are endowed with a rich network of blood vessels, in both the areas of maximum pressure are areas of heightened colour. It might be expected that the exanthem in pellagra would find in them sites of predilection. Though, of course, both may be affected, as pointed out by the Pellagra Commission, Illinois (1911-12)* and as mentioned by HAMEAU long ago (1829)* it is a rare phenomenon and I would suggest that, while the special character of the skin in these situations hinders the appearance of the exanthem, it exaggerates the burning pain. The researches of LEWIS are again of great interest in this connexion. Under the title "Clinical Observations and Experiments relating to Burning Pain in the Extremities (1933, 1934)" he records observations showing that if the skin be damaged in any way it passes sooner or later into what he calls "the susceptible state" *i.e.*, a state in which pain recurs spontaneously and one in which the skin is hypersensitive and the threshold for heat is lowered. The original noxious stimulus may be of any kind including cold, heat and other forms of radiation.

This symptom, which Lewis refers to as erythalgia, was shown to be due to the action on the pain nerve endings of a naturally occurring substance released locally, presumably from the skin cells, like histamine but not histamine.

Any area of skin or mucous membrane may be affected with the "susceptible state." The common site for this pain is the sole of the foot, across the base of the toes, spreading to the remainder of the plantar surface, sometimes also to the dorsum of the foot and the ankle. The palms of the hands may be affected, also the legs and arms, the back of the neck, back and the V-shaped area on the chest, the malar regions and the brows, but elsewhere on the trunk the sensation is only one of warmth. That this same mechanism accounts for the burning sensations in pellagra there can be little doubt.

Of no less importance than the dermal and gastro-intestinal symptoms in pellagra are the nervous and mental manifestations. In the past the custom has been rather to think of the one in terms of degenerated cells and fibres and of the other merely as a cause for detention in an asylum. Here it is not proposed to discuss "the pathology of the dead-house," to use S. A. KINNIER WILSON's apt phrase, nor the chronic demented inmate of the institution. On the other hand one has only to watch carefully a case of acute pellagra to be struck by the fact that the nervous and mental symptoms often vary from day to day, from hour to hour, and that one is witnessing the signs of an acute physico-chemical disturbance in the balance of metabolism within the central nervous system. That the processes going on are "reversible" would seem apparent in view of their variation and quick response to treatment.

These symptoms have always been looked upon as toxic in origin but it would seem more probable that they are of the same order as those which occur in B_1 avitaminosis. Prof. R. PETERS (1936) has shown that vitamin B_1 in the form of "catatorulin" prepared from

yeast acts as a catalyst in the normal combustion of carbohydrate in the central nervous system of pigeons.

The clinical evidence in pellagra suggests that in a similar way the early acute nervous and mental manifestations may be due to the loss of some factor which acts as a catalyst in normal metabolism of nervous tissues—such a loss might be partial or complete, gradual or rapid, temporary or permanent, in this way accounting for the variation in the clinical picture.

The disturbances in function of the nervous tissues may depend upon a change in the normal dispersion of cell colloids in the direction of agglomeration or flocculation as is believed to occur in the manic-depressive psychoses by W. D. BANCROFT & J. E. RUTZLER, Jr. (1931) and H. B. LANG & John PATERSON (1931).

So long as the process has not gone beyond a certain limit or persisted too long, it remains reversible and recovery is possible, otherwise permanent changes occur with symptoms of an organic lesion.

This hypothecated catalyst in pellagra is normally elaborated in the stomach, it is suggested, in an analogous manner to neuropoietin.

Whether the default of a single factor is responsible for the symptoms of pellagra seems uncertain, it is more probable that several factors are involved.

GENERAL SUMMARY AND CONCLUSIONS.

1. Pellagra has a world-wide distribution.
2. There are a number of conditions both in temperate and warm countries which resemble pellagra in that they present many of the symptoms of that disease though not exhibiting the classical triad of signs "Dermatitis, Diarrhoea, Dementia" without which, but quite wrongly, it has been commonly supposed a diagnosis cannot be made.
3. Many cases, without the endemic areas, go undiagnosed because the symptomatology of the affliction is not generally well recognized.
4. There are no separate conditions such as have been designated pseudo-pellagra, para-pellagra, alcoholic pellagra, secondary pellagra, pellagroid, etc.; they are simply cases of pellagra.
5. Maize plays no specific part in the aetiology of the disease.
6. All the Theories of Causation which postulate a specific infective agent lack support.
7. Deficiency of Protein of High Biological value *per se* is not the cause of pellagra.
8. There is no definite evidence that pellagra is a simple avitaminosis.
9. A study of the disease from a wide angle suggests a new hypothesis namely that pellagra is one among a number of conditions which are severally due to a failure in the production of "principles" by the interaction of "extrinsic factor" in the food with "intrinsic factor" normally produced in the gastric juice.
10. In pellagra one or other or both factors may be involved, an extrinsic factor due to deficiencies in diet, an intrinsic factor due to non-secretion consequent upon gastritis.
11. The extrinsic factor is commonly present in foodstuffs containing protein of high biological value and some parts of the Vitamin B complex.

12. The anti-pellagra factor is probably stored in the liver. Refined liver extracts advocated for the treatment of pernicious anaemia should not be used for pellagra.

13. Its action is probably that of a catalyst, governing the metabolism of the cells of the skin, mucous membranes and nervous system.

14. What has been spoken of as the anti-pellagra factor may be really a complex of separate factors.

15. The distribution of the exanthem in pellagra is determined by pre-existing changes in the skin due to traumata of many kinds.

16. The changes in the tissue cells are of the nature of a change in the colloid state of their contents towards lessened dispersion of flocculation.

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MALARIA.

BULLETIN DE LA SOCIÉTÉ MÉDICO-CHIRURGICALE DE L'INDOCHINE.
1936. June. Vol. 14. No. 6. pp. 486-679.—Premier voyage
international d'études malariologiques de la S.D.N. en Indochine.
[First International Study Tour of Malaria in Indo-China under
the League of Nations.]

This issue of the Bulletin contains twenty-seven papers dealing with almost every aspect of the malaria problem of French Indo-China, prepared, in the first place, for the benefit of the participants in the third International Course of Malariology, organized by the Eastern Bureau of the Health Organisation of the League of Nations, in Singapore. A three weeks' tour in Indo-China followed the six weeks' theoretical and practical laboratory course that was held in Singapore. Together these papers give a very complete picture of present malaria conditions in Indo-China and afford striking evidence of the greatly increased effort in this field that has characterized the last five years.

The following 18 papers call for special notice :

FARINAUD (M. E.) & MOREAU (P.). Principes et technique de l'enquête malariologique en Indochine. [The Principles and Technique of Malaria Investigation in Indo-China.]—(pp. 488-497. With 1 folding map & 1 folding plan.)

The principles underlying malaria surveys and the technique employed in carrying them out are well outlined. Both are familiar to all workers in this field. A chart shows in graphic form the geographical distribution of the various organizations and agencies collaborating in the campaign now being waged against malaria in Indo-China.

FARINAUD (M. E.). Développement de la lutte contre le paludisme sur les plantations du sud de l'Indochine. [Development of the Anti-Malaria Campaign in the Plantations of South Indo-China.]—(pp. 498-514.)

This contribution reminds the reader that malaria has been a serious cause of suffering and death in Indo-China since the most remote times and that the "human geography" of the country has been determined in large part by the geographical distribution of malaria. In certain coastal areas malaria is a seasonal disease. As soon as one approaches hilly country in the hinterland malaria is found to be endemic and is a serious obstacle to the economic development of the country. Any unusual movements of population are likely to give rise to explosive epidemics. In the history of the development of rubber plantations malaria has been a vital problem from the beginning. The red-soil districts are specially suitable for rubber plantations. These were very scarcely populated but as soon as forest began to be cleared by imported Annamite labour trouble began. The situation was very critical in 1927-28. In some areas deaths amounted to 400 per thousand of the labour force : deaths, desertions and repatriations resulted in the loss to certain companies of 55 per cent. of their labour forces in 18 months. In 1929 MORIN reorganized the campaign. It was shown that *A. minimus* was the most important vector as it is indeed throughout Indo-China. Drainage and oiling were largely extended. Subsoil drainage is complicated by the very unequal distribution of the rainfall.

in Southern Indo-China. The average annual rainfall is 2,010 mm.; of which 3 mm. falls in January, 337 mm. in September. Falls of 150 mm. in a single day, or in a few hours, are not unknown. Preventive quinine has been largely used. Adult mosquitoes have been attacked by fumigations. Encampments have been built as far as possible from mosquito breeding places and from the villages of the aborigines, of which from 80 to 90 per cent. were found to be infected. The elimination of mosquito breeding by shade plants has been tried, as has flushing. More recently atebrine and plasmoquine (or rather the French manufactured equivalents, quinacrine and praequine) have been used with success. Finally, much attention has been given to general sanitation. As a result of all this it has been possible, nearly everywhere, to control epidemic explosions, to reduce the death rates, and to keep the daily sick rates below 5 per cent. In 1900 the production of rubber in Indo-China amounted to 340 tons; in 1935 to 30,000 tons.

FABRY. Thérapeutique clinique du paludisme. [Clinical Therapeutics of Malaria.]—(pp. 515-523.)

An admirable lecture on the treatment of malaria by a physician who has evidently very wide experience. In the treatment of the attack Dr. Fabry considers that quinine and atebrin have equal value in benign tertian infections, but in severe malignant tertian infections, such as are met with in Indo-China, atebrin is definitely superior to quinine. The treatment of chronic malaria is well handled. The human organism itself and time are the most important factors in recovery and every care should be taken not to damage the former. "Peu de thérapeutiques exigent autant de l'artiste que doit être le médecin."

DOROLLE (P.). Inconvénients et dangers de la malarithérapie dans un pays d'endémicité malarique. [Difficulties and Dangers of Malaria-Therapy in a Country where Malaria is Endemic.]—(pp. 524-532.)

Dr. Dorolle has not had a fortunate experience in Indo-China in the treatment of general paralysis by malaria-therapy. Only *P. vivax* has been used: the local strains of *falciparum* are apt to be too virulent. Infection was given by the subcutaneous injection of infected blood. In many patients there were little or no signs of infection, owing to the patients' immunity, and rarely enough febrile reaction to confer any benefit. In other cases the injection lit up latent infections of malignant tertian or quartan malaria, which were very severe and difficult to cure. Small epidemics of malaria in the neighbourhood of the hospital that were attributed to malaria therapy also occurred. Dr. Dorolle's experience has led him to abandon malaria therapy: in its stead he now uses intravenous injections of dead microbial emulsions.

CANET (J.). Prophylaxie collective par médicaments synthétiques sur les plantations des terres-rouges (1934-1936). [Prevention of Malaria by the Administration of Synthetic Drugs in the Rubber Plantations.]—(pp. 533-559.)

In the malarious rubber plantations of Indo-China the incidence of the disease is high throughout the year but the months of maximum intensity are those which precede and follow the rainy season, that is to say June to August and December to the middle of March. The mass distribution of quinine during these months has proved to be of very limited value. Synthetic drugs have given better results, more

especially the association of quinacrine with praequine. The dosage and other details of treatment have varied according to circumstances. Though the benefits conferred by this "preventive" treatment are very real they are rapidly lost when treatment ceases: continuous treatment is obviously not practicable. A combination of anti-larva prophylaxis and mass treatment with synthetic remedies should, however, produce a permanent improvement in the health conditions of the plantations.

CANET (J.). Organisation de l'hygiène sur les plantations des terres-rouges. [**Organization of Health Activity in Rubber Plantations.**]—(pp. 560-571.)

An account of the general sanitary and health measures that have been applied during recent years to improve the lot of the labour forces on plantations.

MOREAU (P.). Le paludisme au Cambodge. [**Malaria in Cambodia.**]—(pp. 582-586. With 1 coloured plan.)

Cambodia has suffered from malaria from time immemorial. The control of malaria is still the outstanding problem in connexion with the economic development of the country. The indigenous population is highly immune but possesses a very limited capacity for work. The spleen index is higher than the parasite index. The central part of the Province is relatively free from the disease: this is the region of the great lakes. There are parts of the coast where salt-water breeding anophelines, notably *A. ludlowi* (*sundaicus*) convey infection, but the most malarious districts are in the neighbourhood of the hills and of the stony outcrops so characteristic of the country. Here *A. minimus* is the chief vector; other vectors in the order of their importance are *maculatus*, *aconitus* and *jeyporiensis*. Larvae of *umbrosus* have also been found. Cambodia is a country of hyperendemic malaria.

SIMON & DARBES. Résumé des progrès réalisés à Phnom-Penh dans le domaine de l'urbanisme et de l'assainissement. [**Sanitary Improvements in Phnom-Penh.**]—(pp. 587-592)

A record of progress during recent years in the modernization and sanitation of Phnom-Penh, the capital of Cambodia. It is an important river port. Its sanitary problems are complicated by the fact that for several months of the year the water in the river rises well above the level of the drains of the town.

SOUCHARD (L.). L'Institut Pasteur de Dalat. [**The Pasteur Institute at Dalat.**]—(p. 593.)

The fourth Pasteur Institute of Indo-China was opened in 1936 in Dalat, a hill station in the south. Apart from routine and research work connected with local health problems its major preoccupation is the manufacture and distribution of bacterial vaccines.

YERSIN. Note sur les essais d'acclimatation des quinquinas entrepris en Indochine par l'Institut Pasteur. [**Attempts at acclimatizing Cinchona in Indo-China.**]—(pp. 594-595.)

Dr. Yersin, whose name will always be associated with the discovery of the plague bacillus, has been very active in his attempts to acclimatize cinchona in the hilly country of South Annam, at an elevation of about 3,000 feet. The young trees grow very well for a time; they flower and fruit very early, however, which probably indicates a short life. In the fourth year disease begins to attack the trees. The

culture is still in the experimental stage and there is still reason to hope for results that will not be unsatisfactory from the economic point of view.

LE NESTOUR. Protection antimalarienne des chantiers de constructions du chemin de fer de Tourane à Nha-trang (région du Varella). [**Protection against Malaria of the Labour Forces engaged in the Construction of the Tourane-Nha-trang Railway.**](—(pp. 609-611.)

The last section of the Trans-Indo-China Railway is approaching completion. It runs from Tourane to Nha-trang, two towns on the southern half of the long coast line of Annam. Its construction has entailed piercing Mont Varella, which is so picturesque a landmark on the coast : there are seven tunnels, the longest being 1,175 metres. The task of protecting the labour forces engaged on the work from malaria has called for much care ; this force has averaged 2,400 workers. The country is highly malarious. That considerable success attended the efforts is evidenced by the fact that in 1934 the deaths from malaria did not exceed 26. In 1935, however, the death rate was higher ; there were 17 deaths attributed to malaria cachexia.

ANTOINE (M.). Prophylaxie rurale du paludisme par irrigation alternée des rizières. [**Prevention of Rural Malaria by Intermittent Irrigation of Ricefields.**](—(pp. 612-615.)

This is an interesting account of an attempt to control rural mosquito breeding by the intermittent irrigation of rice-fields. If a rice-field be irrigated for three days in six it is dry for twenty-four hours once in six days. This procedure eliminated all mosquito breeding and the crop did as well as that of control rice-fields irrigated in the usual way. Inquiry is still going on with the object of determining the minimum amount of water that is compatible with a good yield.

DENIEL. Rapport sur l'extraction de la quinine et des alcaloïdes totaux des écorces de quinquina de provenance Indochine. [**Method employed in the Extraction of Quinine and of the Total Alkaloids of Cinchona from Locally Grown Bark.**](—(pp. 616-618.)

A description of the method employed for the extraction of quinine and of the total alkaloids of cinchona from locally grown bark. The bark in 1936 yielded on the average quinine sulphate 3.5 per cent. ; total alkaloids 7.4 per cent.

LE NESTOUR. Le paludisme en Annam. [**Malaria in Annam.**](—(pp. 619-624.)

Annam is a long strip of land between the sea and high mountains that is everywhere cut up by isolated hills or off-shoots from the higher range. Such flat country as there is is very densely populated. Wherever there are hills there is very severe malaria, and in the foothills malaria is a killing disease. Years of great dryness are bad malaria years. Normally, violent storms are of frequent occurrence in the dry season which is the malaria season ; these storms are useful as they flush the anopheline breeding places. If crops fail the situation is aggravated by undernourishment of the population. The anophelines found are *minimus*, *maculatus*, *jeyporiensis* and *aconitus*.

VAUCEL (M.). Le service antipaludique du secteur Nord-Indochine. [**The Anti-Malaria Service of North Indo-China.**](—(pp. 625-630.)

The antimalaria service of the Pasteur Institute at Hanoi was created in 1931. The report gives a summarized account of the

surveys carried out and the work accomplished by the Service since its creation.

The northern part of Indo-China consists of (1) the low lying deltaic region, (2) a belt of land between the former, and (3) the Middle Region with numerous water courses; and (4) a high mountainous region with large valleys and deep ravines. In areas 1 and 2 malaria occurs but is not a serious disease: here *A. sinensis* and *A. vagus* predominate, neither being very efficient vectors. In areas 3 and 4 malaria is a deadly disease: here *A. minimus*, *A. jeyporiensis* and *A. maculatus* prevail.

GASCHEN (H.). Les indices maxillaires des anophèles. [**Maxillary Indices of Anopheles.**].—(pp. 631-636. With 6 figs. & 1 chart.)

Previous papers by Gaschen on the maxillary indices of Anopheles have been summarized in this *Bulletin*. This communication refers to the work that has been done and gives an interesting account of the technique employed in counting the teeth and of the difficulties that may be experienced. As a criterion of "pathogenicity" of anophelines the maxillary index is not absolute but its determination is of use in a study of the feeding proclivities of these mosquitoes. The maxillary indices of the zoophile species *hyrcanus* var. *sinensis* and *vagus* are given as 15.7 and 14.2. The malaria vectors have indices as follows: *minimus* 11.3, *aconitus* 11.5, *maculatus* 11.4 and *jeyporiensis* 11.9.

MOREAU (P.). Le paludisme dans l'armée en Indochine. [**Malaria in the Army in Indo-China.**].—(pp. 647-656.)

Malaria has ever been one of the most formidable enemies that the army has had to face in Indo-China. The difficulties have been very great in outlying posts in the high mountainous region in the north, part of which lies along the frontier of China. Here again *A. minimus* is responsible for most of the trouble. Recently antilarval measures near outlying posts, large permanent drainage work in rural centres in the high regions, mass treatment with quinacrine and praequine, the rational utilization of locally raised troops and general attention to the soldiers' well-being have effected a marked improvement.

GASCHEN (H.) & MARNEFFE (H.). Le rôle des vecteurs dits secondaires. [**The Role of Anopheline Vectors of Secondary Importance.**].—(pp. 665-669.)

An interesting discussion of anophelines of secondary importance as transmitters of malaria. The authors call attention to the interesting fact that certain species that play a capital rôle as vectors of malaria in some countries are almost innocuous in others. Examples are given. *A. hyrcanus* var. *sinensis*, an important vector in China and Formosa, is of little account in Indo-China, as a rule, in spite of its prevalence. Recently, however, it was found to be the chief vector in a small localized outbreak in the delta of the Red River, so it is potentially dangerous even in Indo-China. Previously only one infected *sinensis* had been found in Tonkin. Similarly neither *aconitus*, *vagus* nor *maculatus* are of much importance in Indo-China. *A. culicifacies* occurs; one infected specimen was found. Its relative infrequency may be sufficient to explain its local unimportance as a vector.

The remaining nine papers are here noted in title only.

CROS (M.). Note au sujet de l'assainissement antimalarien des centres de Hon-quan et Budop (Province de Thu-dau-mot). [**Note on the Successful Anti-Malaria Measures applied in the Administrative Centres of Hon-quan and Budop.**](pp. 572-574.)

GERBER (M. R.). Budop. Un exemple de sanitation rurale. [**Budop. An Example of Rural Sanitation.**](pp. 575-578. With 1 map.)

COMBAUDON (E.). L'assainissement de la plantation de Snoul. [**Sanitary Improvements in the Snoul Plantation.**](pp. 579-581.)

JACOTOT (H.). Les protozoaires sanguicoles du bétail et de diverses espèces animales de l'Indochine. [**Protozoa in the Blood of Cattle and Other Animals in Indo-China.**](pp. 596-604.)

TREGOUET. La léproserie de Qui-hoa. [**The Leper Asylum of Qui-hoa.**](pp. 605-608.)

FARINAUD & MOREAU. Tuyen-quang. L'assainissement d'un centre de la Moyenne-Région Tonkinoise. Travaux permanents. [**Sanitary Improvements in Tuyen-quang, a Malarious Station in Tonking.**](pp. 637-646. With 1 folding plan & 1 folding chart.)

MARNEFFE (H.) & GASCHEN (H.). Le paludisme côtier dans la région des lacs de mer. [**Coastal Malaria in the Area of Reclaimed Land.**](pp. 657-661.)

RAYNAL (J.), VAUCÉL (M.) & HOANG-TICH-TRY. La réaction de Henry en Indochine. [**Henry's Reaction in Indo-China.**](pp. 662-664.)

GASCHEN (H.). La faune anophelienne du Tonkin. [**The Anopheline Fauna of Tonking.**](pp. 670-679.)

Norman White.

BENGAL, GOVT. OF: PUBLIC HEALTH DEPARTMENT. **Report of the Bengal Field Malaria Research Laboratory at Krishnagar for the Years 1929-1932** [SUR (P.), Assistant to Assistant Director of Public Health].—32 pp. With 14 charts. 1936. Bengal Govt. Press, Alipore.

The Krishnagar Field Laboratory was established in 1926 to study conditions in a hyperendemic malaria region of Bengal. A report on the observations made during the first three years was published in 1929; the present report is concerned with the work done during the four years 1929-1932. The Laboratory was closed down in 1932.

All anopheline breeding places in four villages were examined twice a month. Of the 79,398 larvae caught 53.1 per cent. were *subpictus* or *vagus*, 14.1 *barbirostris*, 10.8 *hyrcanus*, 9.3 *annularis*, 5.5 *philippinensis*, and 5.4 per cent. *pallidus*. The remaining larvae were *ramsayi*, *aconitus* or *varuna*, *tessellatus* and *culicifacies*.

Of adult mosquitoes caught in cattle sheds the most prevalent species were *annularis*, *subpictus*, *pallidus* and *vagus*. In dwelling houses the same species were chiefly in evidence, but here *philippinensis* was also quite numerous.

The only species found naturally infected in any numbers was *philippinensis*: of 2,902 dissected during the last two years the sporozoite infection rate was 2.1 per cent., the highest monthly rate being 5.3. This species is considered to be the most important vector in this part of the Nadia District.

Of the positive blood films examined 1,218 were identified as *vivax*, 1,002 *falciparum* and 975 *malariae*, a very high proportion of quartan fever.

N. W.

MIRA (Mario Giaquinto). La malaria en Guatemala. Estudios epidemiológicos y desarrollo de la campaña antipalúdica. [**Malaria in Guatemala. Epidemiological Studies and Development of the Antimalaria Campaign.**—54 pp. With 1 map, 4 figs. & 3 graphs. Edizioni "Rivista di Malariologia." 1936. Rome : Stamperia Moderna S.A., Via Germanico, 136.

This report summarizes the results of six years' intensive work in the investigation of malaria conditions, and in the control of malaria, that has been carried out by the special department of the General Direction of Public Health of the Government of the Republic of Guatemala. It is not possible to summarize in small space the information contained in a report of 54 pages which is itself but a résumé. All that can be done is to direct attention to certain points of interest.

Guatemala has a population of two million ; it covers 109,000 square kilometres of most diversified country—hot, moist, tropical coastal areas bordering the Pacific and the Atlantic ; high mountainous tracts and volcanoes ; extensive plateaux and plains ; deep valleys and numerous rivers. The twenty-two departments into which the country is divided have very diverse climatic and other conditions : the one characteristic which they all, with but one exception, appear to have in common is the prevalence of endemic or hyperendemic malaria. Malaria is the big social and economic problem of Guatemala ; the future progress and prosperity of the country is intimately bound up with the solution of that problem. That this statement is no exaggeration, facts and figures reproduced in the report amply testify. This is no new problem : malaria has been the scourge of the country from time immemorial. It was only in 1929, however, that a special malaria organization was created by the Government, with laboratory and other equipment, and an ambitious programme, on lines laid down by the League of Nations Health Organisation's International Malaria Conference of 1928.

It is evident that the successful prosecution of an antimalaria campaign in a country with such a variety of geographical, climatological and ethnographic conditions necessitates preliminary comprehensive malaria surveys. Such surveys have occupied much of the attention of the organization. These have embraced the study of morbidity and mortality data, the determination of splenic and parasite indexes, a study of the anopheline fauna and other factors concerned with the delimitation of endemic zones. In various regions local experimental methods of control have been studied. An investigation of the quinine requirements of the country is being made. Lastly, new legislation is being prepared which will provide for the organization of services charged with the treatment and prevention of malaria throughout the country.

The anopheline fauna is rich. *A. albimanus* is considered to be the most important vector ; it is very widely distributed. Though it prefers tropical humid conditions such as exist on the shores of the Atlantic and the Pacific, it adapts itself to hot dry regions as also to the very different conditions prevailing at altitudes of from 1,000 to 1,100 metres, and even higher. In such places, however, its prevalence is not excessive. *A. albimanus* is the most prevalent species in all parts

of the country in which *falciparum* infections are most in evidence. *A. pseudopunctipennis* is also very widely distributed. It has a preference for high altitudes—500 to 800 metres. It is the predominant species in many areas of intense malaria and appears to be most efficient as a vector of *vivax* infections. *A. argyritarsis* cannot be excluded as a vector in certain localities. *A. hectoris* has been found at altitudes of from 1,300 to 1,550 metres; laboratory experiment has shown it to be a potential vector, but its practical importance has not been determined. *A. vestitipennis*, *A. apicimacula* and *A. eiseni* all occur but are probably of little importance.

In the country as a whole *vivax* infections are the most widely diffused; they predominate in all high areas and also in many places little above sea-level. There are localities, mostly low-lying, where *falciparum* infections occur exclusively and many in which they contribute from 25 to 35 per cent. of the total infections. In certain isolated localities quartan infections are very prevalent; there are places in the valley of the Polochic River where 28 per cent. of the positive blood findings were quartan. Mention is made of the high percentage of positive blood films in which gametes were found.

A brief description is given of several malaria control experiments that have been carried out with encouraging results. For example, in Puerto Barrios in 1929 the spleen index was 81·4, the parasite index 38·6; in 1931 they were 58·4 and 16·2, respectively. In Nueva Santa Rosa spleen and parasite indexes of 100 and 38·1 were reduced to 78·3 and 10·2 in the same two years, and in Monjas from 97·5 and 50·5 to 55·1 and 20·2.

N. W.

WHITE (R. Senior). **Williamson's "Herbage Cover" Method of Larval Control. A Preliminary Note on Some Field Trials.**—*Records of the Malaria Survey of India*. 1936. Sept. Vol. 6. No. 3. pp. 439–445. With 3 figs. on 1 plate.

K. B. WILLIAMSON (1935) in a paper entitled "The Control of Malaria by Natural Methods," published in the *Malayan Agri-Horticultural Association Journal*, reprinted by the Eastern Bureau of the Health Organisation of the League of Nations, described his method of "Herbage Cover" to control mosquito breeding (see also this *Bulletin*, 1935, Vol. 32, pp. 429–30). Shallow watercourses are covered with packed grass and herbage, or with leaves of trees, with a few twigs intermixed, so as to form a brushwood drain. The herbage is well trampled under foot until it forms an almost solid wall which, according to Williamson, is impenetrable to egg-laying mosquitoes. In stagnant or slowly moving water sufficiently concentrated rotting, to prevent the breeding of malaria-carrying species, takes place.

Senior White, in this preliminary note, describes three experimental applications of the method in the Jeypore Hills Agency Tracts, Orissa. In the first experiment anopheline breeding was entirely eliminated, in a nullah so treated, from mid-October to the end of April. Similar success attended the second experiment. In the third no rotting took place, the packing merely acting as a rough sub-soil drain. As a consequence anopheline breeding was not eliminated. Culicine breeding was noted in all the experiments. It would appear that

ovipositing mosquitoes in large numbers can penetrate the packing, which "appears to act far less as a form of subsoil drainage than as a strictly biological control." This is in conflict with Williamson's findings: differences in the nature of the vegetation used may well account for the divergent results. It is evident from Senior White's experiments that much depends on the choice of scrub or vegetation used for packing. He considers that, for a thorough investigation into the method, the co-operation of both physiological and systematic botanists will be required.

As a method of mosquito control the method is very inexpensive. In it the author sees a definite hope for antilarval measures for the village. Not only may ravine and irrigation-channel breeding of anophelines be eliminated but the effluent from the "herbage covered" watercourse may well prove to have value as a rich liquid manure. The results of further experimental work along these lines will be awaited with interest.

N. W.

WILLIAMSON (K. B.) & SCHARFF (J. W.). **Anti-Larval Sluicing.**—*Malayan Med. Jl.* 1936. Sept. Vol. 11. No. 3. pp. 123–150. With 2 diagrams & 11 plates. [24 refs.]

This paper contains a general account of sluicing as an anti-larval measure, based, for the most part, on careful experimental work carried out in Malaya for a number of years. The authors evidently consider that the lack of comprehension of fundamental principles has been responsible for certain unfavourable reports on the results achieved. Otherwise a more extended trial might have been made of a form of mosquito control that is inexpensive, easy to operate and adaptable to many conditions.

The difference between sluicing a channel and allowing it to empty itself into one already sluiced is insisted on. There is no evidence that larvae are carried down-stream alive as the result of sluicing; the majority are either killed outright or are thrown up by the sluice wave on the banks to perish there. The characters of a sluice wave are described and illustrated.

Fear of erosion should not be a deterrent to the application of sluicing. Irregularly eroded channels may be unsuitable for sluicing but the erosive action of sluicing is little, if any, in excess of that of the normal flow and certainly less than that of natural spates. This of course does not apply to a small space immediately below the sluice gates, which may require special treatment. Sluicing is therefore applicable even to flat earth channels. The impounding of headwaters may present problems in connexion with mosquito breeding. The planting of shade plants, or the use of larvicides or other measures above the sluice, may be called for in certain cases. Automatic sluices have obvious advantages over the hand-operated varieties.

Numerous examples are given of the successful application of sluicing as an anti-larval measure in the Cameroon Highlands, Malaya, and in Penang. These descriptions are well illustrated with photographs. Some of the sluices described are of the simplest possible kind, their construction being within the competence of any handyman. One cannot but endorse the authors' plea for further trial in various conditions, for which they have made out a good case.

N. W.

CASINI (Guido). Sul così detto fenomeno dell'eliminazione dei globuli polari nei gametociti dei parassiti malarigeni. [**On the So-called Phenomenon of Elimination of Polar Globules in the Gametocytes of Malarial Parasites.**]—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 2. pp. 88-98. With 6 figs. & 2 coloured plates. French summary.

Observations on malarial parasites of man and halteridium of birds have convinced the author that the so-called maturation of the female gametocyte by the extrusion of polar bodies is a misinterpretation of the events. What actually happens is a division of the nucleus, a true nuclear reduction, the no longer required chromatin being thrown out from the female gametocyte and being left in the residual body in the case of the male. Till this reduction has taken place fertilization is impossible. The process is compared with the well known phenomenon of the maturation of the ovum, and is illustrated by two coloured plates of the changes which take place in the malarial parasites.

C. M. Wenyon.

MOSCHKOVSKI (Sch.). Ueber einen eigentümlichen Fund in den von *Plasmodium vivax* befallenen Erythrozyten. [**Peculiar Occurrence in Red Cells infected with *P. vivax*.**]—*Rev. Microbiol., Épidémiol. et Parasit.* 1936. Vol. 15. No. 1. [In Russian pp. 57-59. With 21 figs. on 2 plates. German summary p. 59.]

In stained films of defibrinated blood of two patients with *Plasmodium vivax* infection there occurred commonly in the infected red cells, either in or outside the parasites, a deeply staining chromatin granule. It is assumed that it represents the caryosome of the parasite nucleus and that it had been displaced mechanically by the treatment to which the blood had been subjected.

C. M. W.

BOYD (Mark F.). **On the Schizogonous Cycle of *Plasmodium vivax*, Grassi and Feletti.**—*Amer. J. Trop. Med.* 1935. Nov. Vol. 15. No. 6. pp. 605-629. With 1 text fig. & 124 figs. on 7 plates.

CORRADETTI (Augusto). Osservazioni sul ciclo schizogonico del *Plasmodium vivax*. [**On the Schizogonous Cycle of *P. vivax*.**]—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 1. pp. 14-22. With 1 text fig. & 9 figs. on 1 plate. English summary.

A study of the morphology of a pure strain of *Plasmodium vivax* has convinced the author that five types of merozoite occur and that each of these, after entering red blood corpuscles, grows to its full size in a characteristic manner as judged by the structure of the nucleus. Merozoites of type A grow into schizonts which give rise to merozoites of type A, B or D. Those of types B and D grow into schizonts which give rise to merozoites of types C and E, which grow not into schizonts but into micro- and macrogametocytes respectively. There are thus five lines of growth, the individuals of each line being recognized chiefly by their nuclei but also to some extent by the character of the cytoplasm. The nuclei differ in size, shape and degree of development of the karyosome. The differences referred to are illustrated in a series of diagrams and microphotographs.

In the second paper the author states that he has failed to confirm the above observations and cannot distinguish the series A, B and D,

though he has noted that two kinds of mature schizont occur which differ as regards arrangement of pigment and merozoites. Furthermore the merozoites themselves differ in nuclear and cytoplasmic structure. The two types of rosette were noted by GOLGI in 1889.

C. M. W.

TRENSZ (F.). La valeur pratique de la mélanofloculation de Henry. [The Practical Value of Henry's Reaction.]—*Arch. Inst. Pasteur d'Algérie*. 1936. Sept. Vol. 14. No. 3. pp. 353-390. [89 refs.]

The author describes at some length the conclusions at which he has arrived as the result of a very large experience of Henry's Reaction, to the literature of which he has contributed much. He insists on the necessity of a standardized technique: it is a delicate reaction. Variations in technique make it difficult to compare the results obtained by different authors. Samples of blood should be taken during periods of apyrexia and when the patient is fasting; the serum should not be haemolysed. The author advocates the use of solutions of melanin, which he introduced, and the reading of the results with a photometer. The value of serological curves is discussed (see this *Bulletin*, 1937, Vol. 34, p. 62). During an attack of malaria the determination of the reaction is of little importance compared with the search for parasites, but in a patient who has recently suffered from fever, in whose blood no parasites are found, negative results with Henry's Reaction are of value in excluding malaria as a cause of that fever. In treatment it is of considerable value; serological curves register the result of treatment especially in patients exhibiting post-febrile pathological conditions of spleen or liver. The curve continues to fall as long as the drugs employed are exercising a favourable action. The height of the index gives some indication in chronic cases as to the time that will be necessary for a complete cure to be effected but no indication of the immediate gravity of the illness.

N. W.

PAMPANA (E. J.). A Critical Interpretation of Some Experiments on the Treatment of Malaria.—*Malayan Med. Jl.* 1936. Sept. Vol. 11. No. 3. pp. 154-160.

This lecture, delivered at the International Malaria course at Singapore, calls attention to the difficulty so frequently experienced in drawing any conclusions from observations recorded in malaria literature. Such observations, from lack of adequate control, or from neglect of consideration of factors that may have an important bearing on the subject under study, do not, in many cases, warrant the conclusion their authors derive therefrom. The examples quoted by Dr. Pampana are confined to papers dealing with the therapeutics of malaria. The study of the treatment of malaria in the field is inevitably attended with very great difficulty, and the author of this lecture has rendered very valuable service in calling attention in an able manner to some of the many pitfalls that trap the unwary. The paper merits wide publicity. If all workers in this important field had had clearer ideas of the complexity of the subject, contributions to the literature of the therapeutics of malaria would have been far fewer in number, but our knowledge of the subject might have been greater than it is to-day.

N. W.

VAN SLYPE (W.). Atébrine injectable et paludisme aigu. [**Atebrin Injections and Acute Malaria.**—*Ann. Soc. Belge de Méd. Trop.* 1936. Sept. 30. Vol. 16. No. 3. pp. 429-440. With 2 charts.

Eleven patients suffering from acute malaria were treated with intramuscular injections of dichlorhydrate of atebrin, thirty-three with intramuscular injections of atebrin musonate (dimethane-sulphonate). The doses used were those recommended by the makers. Both preparations were very efficient as antipyretics. Their action on schizonts was slower than it was on the temperature curve; the dichlorhydrate caused the total disappearance of parasites in 5 days, the musonate caused the disappearance in 91 per cent. of the patients in 11 days. Great prudence is necessary in the treatment of small children who are weakly; the authors think the doses recommended for small children are too large. Convulsions followed the injection in three children, one of whom died. Atebrin musonate, 0.125 gm. in 1 cc. of water, is tolerated just as well as when dissolved in 3 cc., the usual dilution.

N. W.

EFENDIEV (M.), ADJALOV (S.), VINNITSKI (B.), GLASHKINA (T.), MELIKOVA (T.), RAKHMANOVA (E.), SADYKHOV (A.) & TARIVERDIEV (G.). [**Treatment of Malaria with Plasmocide and Acriquine.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 3. [In Russian pp. 422-425.]

An account is given of the results and methods of treatment of malaria with plasmocide and acriquine [the Russian equivalents of Fournau 710 and atebrin respectively]. The observations on plasmocide are based on over 32,000 cases of all the three varieties, but mainly of M.T. The authors note the success of treatment in B.T. and Q., and the failure in M.T. cases. In view of the toxicity of the preparation the daily dose is now reduced from 0.15 to 0.06 gm.

Acriquine was used in 900 cases (291 M.T., 48 B.T., 6 Q and 33 mixed infections) in doses of 0.1 gm. administered thrice daily *per os* for 7 days, followed by an interval of 3 days and a course of plasmocide for 5 days afterwards. The results of treatment are the same as in the case of atebrin, the only after-effect noted being the yellow colouration of the skin.

C. A. Hoare.

AKASHI (Kazuyoshi), NAKASHIMA (Yoshio) & Yō (Kinsei). Ueber Malaria-behandlung mit Atebrin pro injectione (Atebrin Musonate).—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Nov. Vol. 35. No. 11 (380). [In Japanese pp. 2463-2472. With 12 charts. German summary p. 2473.]

ROSA (A.), VALLI (E. Suzzi) & MACCOLINI (R.). Ancora sull'atebrin e la plasmochina nella bonifica umana antimalarica. [**Atebrin and Plasmoquine in the Treatment and Prevention of Malaria.**—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 4. pp. 258-288. With 1 map. English summary.

In five malarious villages in the Basso Ferrarese an attempt was made to control malaria by the administration of atebrin and plasmoquine to all sufferers from malaria and to all who had suffered from the disease during the previous season; no other measures for the

control of the disease were employed. At the beginning of the experiment a five days' course of atebtrin was followed by an interval of six days when a three days' course of plasmoquine was given. Later on atebtrin and plasmoquine were given together, daily for three days, and then atebtrin alone during the succeeding two or three days. The latter treatment appeared to give better results and intolerance symptoms, rare in both cases, were less frequent. In three villages, where the houses are less crowded together than in the other two, and where communications with adjacent malarious centres are restricted, the results were excellent. In one village malaria has almost disappeared. In the remaining two villages the reduction in the incidence of malaria was much less marked.

N. W.

RAO (B. A.) & CHELUVARAYAN (C.). **Mass Treatment and Prophylaxis with Atebrin.**—*Records of the Malaria Survey of India*. 1936. Sept. Vol. 6. No. 3. pp. 447-452.

The experiment described was carried out in the Bobbur Experimental Farm, Mysore, which has a stable population of 303. In April and again in November 1935 the majority of the population was submitted to a five days' course of atebtrin, 0.1 gm. three times a day for adults. A month after the second course the same population was given a five days' course of treatment with plasmoquine, the adult dose being 0.01 gm. twice a day. In addition, from the 1st of January to the end of November 1935, each person received 0.02 gm. atebtrin in a single dose on one day each week. One hundred and seventy persons completed the entire course. The spleen and parasite rates of these persons were 41.5 and 17.6 per cent. respectively in April 1935; in the following November these rates had been reduced to 10.7 and 0.6 per cent. There was no corresponding diminution of spleen and parasite rates in the adjacent Bobbur village, which served as a control. The malaria transmission season in this part of India is from August to December. The cost of such mass treatment is high, Rs.11 per head per year.

N. W.

FISCHER (Otto). Beobachtungen bei der Malariaphylaxe mit Atebrin. [**Malarial Prophylaxis with Atebrin.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 397-400.

Two cases are described in which prophylactic administration of atebtrin protected completely against malarial infection.

In the case of one patient the author advised him to take whilst in the highly malarial parts of the Cameroons alternately $\frac{1}{2}$ and 1 tablet of atebtrin daily, gradually reducing the dose to $\frac{1}{2}$ tablet daily (each tablet contains 0.1 gm. atebtrin). This scheme of prophylaxis was carried out during more than 2½ years with very good results and the person was able to continue his work without interruption. He had no unpleasant toxic symptoms. The skin had a sunburnt appearance. It was found that the smaller dose was efficient as a prophylactic. The other case was a female, aged 27, who was in East Africa from 1931 to 1936. From 1935 she was given prophylactically 3 atebtrin tablets weekly, because quinine was causing palpitation and insomnia. The atebtrin caused no unpleasant symptoms, the skin showed the same sunburnt appearance. She remained free from malarial infection. He warns against the simultaneous administration of atebtrin and plasmoquine as likely to produce toxic symptoms.

E. D. W. Greig.

BISPHAM (W. N.). **A Report on the Use of Atabrine in the Prophylaxis of Malaria.**—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 547-562.

In many areas in the Southern states, in which Civilian Conservation Corps Camps were established in 1933, malaria has been an important cause of morbidity among the enrollees. It was not possible in many cases to eliminate malaria by general antimalaria measures. In 1934 all the inhabitants of the camps had their blood examined once a month; whenever parasites were found the carrier was treated with atabrin, $4\frac{1}{2}$ grains a day for five days. Thereafter the blood of each carrier was examined every two weeks till the end of the year. Nearly all cases were *P. vivax* infections. In 1935 this measure was supplemented; whenever a camp had five malaria cases in a week the entire personnel were given three grains of atabrin a week until the number of cases had fallen to a negligible point. The average strength of a camp approximated two hundred.

The authors conclude that, as a prophylactic, atabrin is far superior to quinine; increased doses would probably give still better results. In the treatment of *vivax* infections atabrin is superior to quinine; it is also cheaper as much smaller amounts are required. N. W.

WINCHESTER (M. E.). **Individual Chemoprophylaxis against Malaria. Preliminary Report.**—*Southern Med. Jl.* 1936. Oct. Vol. 29. No. 10. p. 1029.

An interesting experiment to determine the value of atabrin as a prophylactic. In a highly malarious part of Georgia two groups, each consisting of 28 families, living in exactly similar conditions, were selected. In the prophylactic group the spleen rate was 46 per cent., the parasite rate 7.8 per cent. In the control group the spleen rate was 32 per cent., the parasite rate 10.4 per cent. In April 1935 all persons with positive blood smears, in both groups, were given a complete course of atabrin. On May 15th prophylaxis was started: each individual in one group took a 50 mgm. tablet of atabrin with the evening meal. The members of the control group were left to their normal self-medication. This was continued till the 1st of November. During the spring and summer there were 58 cases of malaria in the control group, none in the prophylactic group. The type of malaria is not stated. N. W.

BERNY (P.) & NICOLAS (L.). Note sur la campagne antipaludique effectuée en 1936 à la crique anguille (Guyane française) avec la médication mixte (quinacrine-rhodoquine). [**Prophylaxis of Malaria with Quinaerine and Rhodoquine in French Guiana.**]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 870-872.

A description of a successful attempt to control malaria in a penitentiary, 39 kilometres from Cayenne, French Guiana. The population affected varied between 101 and 138; it was, for the most part, a stable population and all adults. Malaria infections were almost exclusively *falciparum*. The vector was *A. albicans*.

In November 1935 the parasite index was 13; at the end of the following month it was 21. Drug prophylaxis began on the 1st of January 1936. Each Sunday each man was given quinaerine 0.30 gm. and rhodoquine 0.02 gm. This was continued for six months. There

was no sign of drug intolerance and no interference with work. Early in April the parasite index had fallen to 1 and the general health conditions of the group were excellent. At the end of the treatment the parasite index was zero. In the neighbourhood malaria was very prevalent.

[In the discussion of this paper Ph. DECOURT pointed out that experience elsewhere had shown that it was sufficient to administer this mass "mixed prophylaxis" twice a month.] N. W.

MANWELL (Reginald D.) & HERMAN (Carlton). **The Occurrence of the Avian Malarías in Nature.**—*Amer. Jl. Trop. Med.* 1935. Nov. Vol. 15. No. 6. pp. 661-673. [14 refs.]

The examination of 652 birds, the majority of which were caught in the neighbourhood of Syracuse (New York), for evidence of malarial infection has shown that 54 were infected with representatives of seven known and one unknown species of *Plasmodium*. The procedure of inoculating blood into English sparrows or canaries, practised in 127 cases, gave much better results than other methods used for detecting parasites. C. M. W.

WOLFSON (Fruma). **Bird Malaria transmitted by the Intravenous Injection of Sporozoites.**—*Jl. Parasitology.* 1936. June. Vol. 22. No. 3. pp. 291-292.

In two out of three experiments canaries were infected with bird malaria by the intravenous injection of sporozoites from *Culex pipiens*. Previous attempts by other observers have failed, though it is well known that human beings can be infected by intravenous injection of sporozoites from Anopheles. In the case of the two infected birds parasites were first seen about the tenth day. C. M. W.

RAFFAELE (Giulio). **Potere infettante del sangue durante l'incubazione della malaria aviaria. [Infectivity of Blood during the Incubation of Avian Malaria.]**—*Riv. di Malariologia.* Sez. I. 1936. Vol. 15. No. 2. pp. 77-87. English summary.

It is well known that after malaria-infected mosquitoes are allowed to feed on a susceptible host parasites do not appear in the blood for some days. The assumption is that the sporozoites do not directly enter the red blood corpuscles but that some form of development occurs outside the blood stream during the latent period and that finally there are produced the red-cell-invading forms. The author has still further tested the absence of parasites from the blood by injecting into fresh canaries blood taken from canaries at varying intervals after mosquitoes infected with *Plasmodium relictum* had fed on them. In this way it was shown that parasites do not appear in the blood before the sixty-fifth hour. The infections produced by blood taken on the third or fourth day are characterized by their mildness. C. M. W.

SINTON (J. A.). **Studies in Immunity in Malaria. Part V. The Nature of the Tolerance shown by *Silenus irus* to Infection with *Plasmodium knowlesi*.**—*Records of the Malaria Survey of India.* 1935. Dec. Vol. 5. No. 4. pp. 501-521. [20 refs.]

It is well known that the monkey *Silenus irus* (*Macacus cynomolgus*), as it is procured in India, is very tolerant of experimental infection

with *Plasmodium knowlesi*. In this respect it differs from the highly susceptible *Silenus rhesus* (*Macacus rhesus*, *Macaca mulatta*). All attempts to break down this resistance by varying the dosage of parasite and virulence of strains used failed entirely, so that the author was led to the conclusion that the tolerance is something inherent in this species of monkey, though it has not been possible to test laboratory-bred monkeys, which would be known to have had no previous infection. Splenectomy, however, is capable of bringing about a severe relapse of a latent infection and if performed before inoculation will render the animal highly susceptible. The general conclusion is that the tolerance is bound up with tissues, probably reticulo-endothelial cells, of the spleen, and not with immune substances in the blood serum, unless it be assumed that splenectomy causes rapid disappearance of these.

C. M. W.

NAUCK (E. G.) & MALAMOS (B.). Thorotrast-Speicherung bei experimenteller Affenmalaria (*Pl. knowlesi*). [**Thorotrast Blocking in Experimental Monkey Malaria** (*Pl. knowlesi*).]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. May. Vol. 40. No. 5. pp. 187–197. With 7 figs. [21 refs.]

The authors have found that intravenous and intraperitoneal injections of colloidal Thorium Dioxid-Sol (Thorotrast) have no influence on the course of *Plasmodium knowlesi* infection in monkeys, though the material is taken up by the reticulo-endothelial cells, as evidenced by X-ray photography and post-mortem histological examination. There thus appears to be no functional blocking of the reticulo-endothelial system by thorotrast.

C. M. W.

SHUTE (P. G.) **A Simple Method of rearing and maintaining *Anopheles maculipennis* throughout the Year in the Laboratory.**—*Jl. Trop. Med. & Hyg.* 1936. Oct. 15. Vol. 39. No. 20. pp. 233–235. With 3 figs.

The author describes methods which have been used successfully for several years to maintain a supply of *Anopheles maculipennis* (no doubt of the race *atroparvus*) in the laboratory.

The early stages are reared in shallow earthenware pans about 18 in. (50 cm.) in diameter. Strips of grass and grass roots are cut and stuck round the edge of the pan close to the water level, and it is found that as many as 300 larvae will grow up successfully in such a pan, and that they do not require artificial food. It has been noticed that in spite of artificial heating some females tend to hibernate in the autumn and winter, and that it is much more difficult to obtain a supply of eggs at that season than in summer.

A special insectary has been built heated electrically and with thermo-static control of temperature, and a small pig kept in it as food for the insects. In the stock which has been maintained continuously for three years the author has observed a considerable range of variation in the colour of the eggs and in the number of ridges in the floats, but in spite of the variation none of the batches of eggs could have been attributed to any race other than that to which they belonged.

P. A. Buxton.

DE JESUS (P. I.). **Physicochemical Factors in Anopheline Ecology, I: Studies on Nitrogen.**—*Philippine Jl. Sci.* 1936. Apr. Vol. 59. No. 4. pp. 473–491. [24 refs.]

The contents of the paper are indicated by its title. The author demonstrates in a quantitative manner that *Anopheles minimus* var. *flavivittatus* breeds in clean, unpolluted water, of which the nitrogen content is low.

After giving a partial review of the literature on a subject which has attracted much attention, the author turns to a study of those nitrogenous substances in water which may be presumed to influence the species under study. He has collected 170 samples of water, making a count of larvae at the same time. The first table sets out the frequency of larvae of *minimus* and other species at different concentrations of ammonia nitrogen. It is clear that the larvae of *minimus* were most frequently found when the concentration was under 0.1 part per million. But the larvae may occur when the concentration is as high as 0.35: beyond that figure there are no records, but it is not clear from the table whether any water samples were examined in which the ammonia passed that figure, larvae not being found. Other tables deal in a similar way with the distribution of larvae, with reference to concentration of other nitrogenous materials. P. A. B.

SIMATCHKOVA (M. S.). **The Factors influencing the Distribution of the Mosquitoes *A. maculipennis* in the Diurnal Resting Places.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 4. [In Russian pp. 549–564. With 7 figs. [11 refs.] English summary p. 565.]

In the interior of buildings the resting places of *A. maculipennis* are determined by various factors making up the microclimatic conditions. Where there is no draught and no direct sunlight, temperature and humidity are the prevailing factors. The author found that with a relative humidity below 65, the number of mosquitoes and the degree of humidity ran parallel; this did not hold good with a higher degree of relative humidity. Determining factors then were light and draughts. If the humidity is adequate and there is no draught and no bright illumination the distribution is fairly equal. Where temperature is low, they preferred the higher levels near the ceiling; with higher temperature, they settle nearer the floor, but only if the temperature beneath their level is lower. It is concluded that at the usual summer temperatures the optimal zone of humidity is at 65 per cent. Migration within a building was found to depend on the length of time after feeding, *i.e.*, on the stage of blood digestion. H. H. S.

THOMPSON (T. O.). **Mosquito Destruction by James' Method.**—*Jl. Roy. Army Med. Corps.* 1936. Nov. Vol. 67. No. 5. pp. 331–335. With 5 figs.

J. F. James's method of fumigation and trapping mosquitoes was referred to in this *Bulletin* (1935, Vol. 32, p. 818). It is now used as a routine anti-malaria measure in the barracks in Bannu, India, and the results obtained are described in this paper. "The stream of mosquitoes which pour out of a room to the lighted opening to escape from this

fumigant has to be seen to be believed." Annual catches of mosquitoes have been from 15,000 to 18,000, of which the majority have been anophelines. N. W.

OMAR (Wasfy). **A New Larvicide.**—*Jl. Egyptian Med. Assoc.* 1936. Oct. Vol. 19. No. 10. pp. 592-608.

Acid-oil-sludge is a waste product of the operation of refining the benzine and kerosene distillates of crude oil. It is a very thick reddish-black acid liquid of no commercial value. If one part of this sludge be added to 1,000 parts of water containing larvae and pupae of anophelines or culicines all such developmental forms die within a few hours. The larvicidal action of the sludge is attributed chiefly to its soluble ingredients. N. W.

BLACKWATER FEVER.

DIMISSAS (C. A.). Quelques observations sur l'épidémiologie de la fièvre bilieuse hémoglobinoïdique en Grèce. [**Some Observations on the Epidemiology of Blackwater Fever in Greece.**—Paper presented at Panhellenic Med. Congress, Thessalonica, 1935. [Original in Greek 34 pp. With 8 figs. [38 refs.] Summary prepared from a French résumé supplied by author.]

The author records a number of observations on the incidence of blackwater cases in malarial districts of Greece, and from these observations he draws certain conclusions.

He found that in the same region, in towns and villages having the same amount of malaria, the inhabitants of which were living under the same conditions and belonged to the same race, blackwater fever occurred in certain places and not in others. His attention was first drawn to this fact in 1920 when he had to deal with a small epidemic of the disease at Comotini; between September and November of this year he encountered 60 cases in a certain quarter of the town. No case was seen in any of the surrounding villages, although malaria was particularly intense. In 1928, he made similar observations at Paros, information concerning which is given in some detail. Reference is also made to similar observations made by other writers in Greece and elsewhere.

The number of cases and even the severity of the disease varies in different years. Most of the cases occur during the autumn, and the disease is more common among children and adolescents than among adults. Instances of the disease were often found in the same house in people unrelated to one another. A decrease in the number of cases of blackwater fever in a district appears to follow a diminution in the amount of malaria and in the number of anophelines.

From these observations the author draws a number of conclusions. He considers that blackwater fever presents itself as a nosological entity which is specially and intimately connected with malaria. The cause of the disease is probably a haemolytic strain or variety of *Plasmodium falciparum*. Individuals who react well to small infections of blackwater fever acquire an immunity (premunition); those who do not react well or in whom the premunition is exhausted or diminished by external causes such as cold, fatigue, quinine, etc., develop typical blackwater fever. W. Yorke.

HERNÁNDEZ GÓMEZ (J. G.). Nuevas consideraciones sobre el síndrome febril icterohemoglobinoïdico. [**Fresh Considerations on the Blackwater Fever Syndrome.**—*Gac. Méd. de Caracas*. 1935. July 15. Vol. 42. No. 13. pp. 193–194.]

After some preliminary remarks the author states "although the malaria plasmodium is not the [sole] cause of the bilious haemoglobinoïdic syndrome we believe that there is no syndrome in the absence of the plasmodium" and later "when during the haemoglobinoïdic period a strong dose of quinine is given without any preceding administration of antihæmolytics, there is nearly always a violent access of fever with haemoglobinoïduria, which may or may not cease when the drug is stopped," but if antihæmolytics have been given, though there may be similar accessions of fever, haemoglobinoïduria will

not occur. If atabrin is given in the pre-haemoglobinuric stage, in place of quinine, the febrile attacks lessen in severity and haemoglobinuria does not occur. If the atabrin is given in the haemoglobinuric stage the symptoms begin to clear up and if antihæmolytics be given as well, the results are surprisingly good. The ideal treatment he affirms is "Prevent hæmolysis, restore to the red corpuscle its normal resistance by use of antihæmolytic substances and at the same time attack the parasite without jeopardizing the life of the patient." [Sound in theory but unfortunately the author does not tell us what "antihæmolytic" he utilizes for this purpose.] H. H. S.

WITTS (L. J.). **The Paroxysmal Haemoglobinurias**—*Lancet*. 1936. July 18. pp. 115–120. With 3 figs. [26 refs.]

This paper is an interesting review of the various paroxysmal haemoglobinurias. Haemoglobin is present in the body in two distinct forms, the haemoglobin of the red cells and the myohaemoglobin of the muscles. Myohaemoglobinuria is more familiar to veterinarians than to physicians and is not uncommon in horses and probably other domestic animals.

True haemoglobinuria is usually, if not always, the result of intravascular lysis of the red corpuscles, and in cold haemoglobinuria and in blackwater fever it has been clearly demonstrated that haemoglobinaemia always precedes the haemoglobinuria. A description of each of the following types of haemoglobinuria is given and the descriptions are illustrated by references to cases: "Haemoglobinuria e frigore"; "Haemoglobinuria from exertion"; "Haemoglobinuria recurrens vel nocturna cum anaemia hæmolytica (Marchiafava-Micheli)"; "Paroxysmal Haemoglobinuria with Stengel's splenomegaly."

In his conclusions the author writes as follows:—

"It is only by ranging the different varieties of haemoglobinuria alongside each other that we can separate the symptoms which are common to all forms of haemoglobinuria from those which are peculiar to the individual examples, nor can it be without value to be familiar with the forms of haemoglobinuria whose mechanism has been elucidated before trying to solve such a difficult riddle as the nature of blackwater fever.

"(a) Haemoglobinuria is usually if not always the result of intravascular hæmolysis and haemoglobinaemia.

"(b) Symptoms common to all forms of haemoglobinaemia and haemoglobinuria are shock, anaemia, diminution or suppression of urine, and thromboses in various parts of the vascular tree.

"(c) Recurrent or paroxysmal haemoglobinuria is not always syphilitic, and the following types can be distinguished:—

"1. Haemoglobinuria e frigore, in which the blood is lysed by exposure to cold either in vivo or in vitro, and which is usually if not always due to syphilis.

"2. Haemoglobinuria from exertion, which is a relatively harmless abnormality occurring in young males. It is probably similar in pathology to postural albuminuria and spontaneously disappears in adult life.

"3. Haemoglobinuria, usually nocturnal, associated with hæmolytic anaemia. This is an intractable disorder of unknown aetiology with a bad prognosis.

"4. Paralytic haemoglobinuria, in which the pigment is derived from the muscles and the attacks of myohaemoglobinuria are associated with weakness and paralysis of the skeletal muscles.

"I have arranged the different types in order of frequency. There is reason to believe that other forms of paroxysmal haemoglobinuria also occur, but such forms as do not belong to one or other of the above four groups must be excessively rare."

W. Y.

HAMBURGER (Louis P.) & BERNSTEIN (Alan). Chronic Hemolytic Anemia with Paroxysmal Nocturnal Hemoglobinuria—*Amer. Jl. Med. Sci.* 1936. Sept. Vol. 192. No. 3. pp. 301-316. [40 refs.]

After a brief review of the various haemoglobinurias the authors describe two cases of an uncommon type of chronic haemolytic anaemia associated with paroxysmal haemoglobinuria.

The haemoglobinurias may be of exogenous origin and associated with infections and intoxications; recently a new member was added to this group when the discovery was made that the consumption of fish or eels containing resinous acids was followed by a malady, a feature of which is haemoglobinuria. This disorder is indigenous in the vicinity of Königsberg and is known as Haffkrankheit (STOELTZNER 1932) [See *Bull. of Hyg.* 1933, v. 8, 505, 506, 632; 1934, v. 9, 55, 411, 412.] Another condition associated with haemoglobinuria is "favism," which is caused by the inhalation from blossoming bean plants of the species *Vicia fave* or by the ingestion of the beans.

Haemoglobinurias of endogenous origin are cold haemoglobinuria, march haemoglobinuria, and the so-called paralytic haemoglobinuria. A fourth type was added in 1931, when MICHELI described a well-defined clinical entity, a prominent feature of which was paroxysmal haemoglobinuria. Two new instances of this uncommon type of haemoglobinuria are the subject of the present paper.

The patients suffered from chronic anaemia associated with paroxysmal haemoglobinuria. The urinary discolouration occurred chiefly at night. Concomitant variable symptoms and signs of the syndrome are abdominal, lumbar and substernal pain, jaundice and fever. The chief blood changes are an anaemia which may become profound, reticulocytosis, and perpetual haemoglobinaemia. The urine always contains a little urobilin and haemosiderin. The patient may live for years and therapeutic measures are of little avail. Splenectomy is dangerous and without benefit; and the same applies to blood transfusions.

The authors discuss the differential diagnosis of this condition from other paroxysmal haemoglobinurias, haemolytic anaemias, and congenital haemolytic icterus.

W. Y.

FERNÁN-NÚÑEZ (M.) Hemoglobinuric Fever: is it an Allergic Phenomenon?—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 563-577. [23 refs.]

This paper reviews the various theories of the aetiology of blackwater fever advanced by numerous investigators, and submits evidence to support the author's thesis that the disease is essentially of allergic origin. Observations were made on about 100 cases encountered by the author during 5 years' practice in the Magdalena river valley of Colombia.

After briefly reviewing "the specific theory," the "malaria theory" and the "quinine theory" which have been advanced to explain the

condition of blackwater fever, the author passes to a consideration of his "allergy theory." He writes as follows:—

"The story of blackwater fever then seems to be: A non-immune person has an attack of subtertian malaria during his first two years of residence in a malarial district. This may produce an immunity, but if the immunologic process goes wrong he may be sensitized to the disease instead in the way the first attack of tuberculosis sensitizes the patient (childhood type of tuberculosis). A subsequent attack of estivo-autumnal malaria (after approximately two years of residency there) produces an allergic reaction with destruction of the sensitized erythrocytes, just as a subsequent attack of tuberculosis produces pulmonary tuberculosis with cellular destruction (adult type of tuberculosis). One attack predisposes to other attacks, 10 per cent. of all cases having recurrences, sometimes as many as ten different attacks (not relapses).

"Symptoms of blackwater fever usually appear promptly after infection by a mosquito bite (within 12 days), [This is a strange statement. What about the attacks of blackwater fever which occur in malarial patients after their return to England and other non-malarial countries?] while the incubation periods of first attacks of malaria may be as much as six months, depending upon the resistance of the host. Fortunately the risk of death is largely confined to the first attack as tolerance is quickly acquired, probably by saturation of the allergic receptors attached to the cells, as is seen in the gradual desensitization in hay-fever by repeated pollen injections. Whether immunity or allergy will occur in a given individual seems to depend upon the state of the general health. In persons with lowered resistance allergy seems more prone to occur, paroxysms of haemoglobinuria usually following malnutrition, chronic organic disease, an intercurrent infection, debility or alcoholism, excessive fatigue and being ushered in by a chilling of the body, excitement or depression, which may cause great activity in the spleen, it even contracting to one quarter its normal size.

"This allergy could result from sensitization by protein antigens of the malaria parasites, the allergic attacks being precipitated by a reinfection or reactivation of a latent infection of the same species or strain of plasmodium. Quinine by destroying the parasites could liberate the allergens quickly and bring on an attack, thus accounting for the fear of the use of quinine in blackwater fever. It is well known that a slight dose of quinine can precipitate a fatal attack of hemolysis and that there is no relationship between the number of parasites and the severity of the paroxysms.

"The numerous cases of blackwater precipitated by treatment of malaria with Atebrin and Plasmochin reported by Banerjee, Moir and others suggest a rôle similar to that played by quinine.

"The blood is often negative for malaria parasites during or after an attack of hemoglobinuric fever, which fact strongly suggests their universal destruction by a hemoclastic process. This destruction of the parasites often cures the disease spontaneously, *i.e.*, without quinine. This frequent absence of parasites was greatly confusing to the earlier investigators and led them to search for a cause other than malaria.

"Of course, it is possible that the hemoglobinuria in some instances is due entirely to quinine allergy. Blackwater is certainly much more common in persons with quinine idiosyncrasy. It is probable, however, that the attacks of quinine hypersensitiveness serve only to precipitate the anaphylactic picture, just as does chilling of the body, exhaustion, etc. Death has occurred within twenty-four hours after taking quinine, quite evidently due to anaphylactic shock."

The author describes what he considers to be a method of prophylaxis. A suspension of parasitized red cells containing *P. falciparum* was made by the method of Bass. To this 0.4 per cent. of formalin was

added as a preservative. Persons of white or mixed ancestry who had lived in the Lebrija river valley of Colombia for 6 months or more—a region where blackwater was very common—and who gave a history of malignant tertian malaria, were injected intracutaneously with 0.2 cc. of the suspension. Of 410 individuals so tested 16 showed a positive reaction characterized by local inflammation, appearing within 12 hours, and followed by a reddish discoloration (haemolytic?) which turned black within a few days, then brown, yellow and eventually faded away in less than 2 weeks. "All persons showing a positive reaction were invalided to a non-malarious climate, and blackwater fever disappeared from the community." Thus, writes the author, the control of aestivo-autumnal malaria, or the removal of those showing allergy to it, would appear to eliminate blackwater fever from any region.

W. Y.

ARMENTANO (L.) & BENTSÁTH (A.). Hämoglobinurie und Vitamin C. [**Haemoglobinuria and Vitamin C.**]—*Klin. Woch.* 1936. Oct. 31. Vol. 15. No. 44. pp. 1594–1596. [15 refs.]

A patient suffering from paroxysmal haemoglobinuria was found to be highly deficient in ascorbic acid, and it was decided to ascertain whether the administration of this substance had any action on the disease. Details of the case are as follows.—The patient, aged 36, came under observation on 10th December, 1935. He gave a history of attacks of paroxysmal haemoglobinuria for 2 years. The man was pale, the erythrocyte count was 2,500,000, haemoglobin 42 per cent., leucocytes 8,100, and thrombocytes 270,000; spleen not palpable; syphilis in youth, Wassermann reaction + + + +. On 13th December a cold foot-bath produced an attack of paroxysmal haemoglobinuria. On 18th December the Donath-Landsteiner reaction was positive, and another cold foot-bath produced a typical attack. On 28th December Vitamin C, 600 mgm., was given intravenously and 5 minutes later exposure to cold failed to produce an attack of haemoglobinuria, although the Donath-Landsteiner reaction remained positive. On 14th January 1936, exposure to cold produced a typical paroxysm of haemoglobinuria. From 16th to 31st January the patient was given daily an intravenous injection of 300 mgm. of Vitamin C. On 1st February and on subsequent dates up to 31st May numerous attempts to produce an attack of haemoglobinuria by exposure to cold failed.

The authors believed that ascorbic acid acts by decreasing the amount of autohaemolysin; they note that saturation of the patient with Vitamin C caused the Wassermann reaction to become negative. It is considered that this work justifies a trial of ascorbic acid in blackwater fever.

W. Y.

DICKSON (J. G.). **Paroxysmal Hemoglobinuria. With Report of a Case followed for 13 Years.**—*U.S. Nav. Med. Bull.* 1936. July. Vol. 34. No. 3. pp. 300–306. [16 refs.]

A general account of the disease with special reference to a case which came to the author's notice.

The patient—a man aged 40—first came under observation in January 1922, complaining of chills and bloody urination following exposure to cold. He dated his illness to the summer of 1918 when, on duty of mine-planting in the North Sea, he became abnormally susceptible to cold.

In March, 1922, he was admitted to the United States Naval Hospital. The Donath-Landsteiner test was positive. After the patient had been placed in the ice-box at 5°C. for 45 minutes, he developed a rigor when he came out and voided red urine. The Wassermann reaction was positive; and the leucocyte count was 13,950. The spinal fluid was normal. The patient was given injections of mercury succinimide and neoarsphenamine, and discharged to duty after 3 of each with a recommendation that 5 more injections of neoarsphenamine be given before allowing a rest period.

The patient has not been seen since 1922, but on April 15th, 1935 he wrote that he is now in excellent health and has never had any more "bloody discharges," and has had no further treatment. W. Y.

GUNTHER (Carl E. M.). **A Case of Blackwater Fever showing Intermittent Haemoglobinuria.**—*Med. Jl. Australia*. 1936. Apr. 18. 23rd Year. Vol. 1. No. 16. pp. 542-543. With 1 chart.

A clinical account of a case which presented no features of special interest. W. Y.

AKASHI (Kazuyoshi). Ueber den Kochsalzgehalt des Blutes beim Schwarzwasserfieber. [**On the Sodium Chloride Content of the Blood in Blackwater Fever.**]*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Mar. Vol. 35. No. 3 (372). [In Japanese pp. 602-622. With 8 charts. [11 refs.] German summary p. 623]

The author estimated the sodium chloride content of the plasma, whole blood, and red cells in a series of 30 healthy men and the same number of healthy women, and he compared the results with his findings in 8 cases of blackwater fever.

In blackwater fever the sodium chloride content of the plasma decreased during the paroxysm, but during recovery it rose so as to exceed the normal, and then finally returned to the normal value.

In whole blood the sodium chloride content rose during the paroxysm on account of the considerable decrease in the volume of the red cells. After the attack it fell towards normal, then rose again, and finally returned to normal. These fluctuations shown by the whole blood are, of course, determined in large measure by the decrease and subsequent increase in the volume of the red cells. W. Y.

AKASHI (Kazuyoshi). **The Treatment of Blackwater Fever with Sodium Bicarbonate.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Mar. Vol. 35. No. 3 (372). [In Japanese pp. 591-601. With 3 charts. [23 refs.]. English summary p. 601.]

Four cases of blackwater fever were treated by daily intravenous injections of 100 cc. to 300 cc. of a 5 per cent. solution of sodium bicarbonate; this was combined with oral administration of 3 gm. to 7 gm. of sodium bicarbonate daily. Owing to vomiting, the author regards the oral administration as of little importance. Three of the 4 patients recovered; in 2 of these the urine cleared quickly and in all 3 cases diuresis increased remarkably after the injections. W. Y.

MOREAU (P.). Quinacrine et fièvres bilieuses. [**Quinacrine and Blackwater Fever.**].—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Feb. Vol. 14. No. 2. pp. 228-249. [134 refs.]

A general discussion of the relative merits of quinine and atebrin in the treatment of malaria with special reference to the value of the latter in blackwater fever cases. It contains no new observations.

W. Y.

SAMPEDRO (Mariano Maldonado). Un caso de fiebre hemoglobinurica tratado con exito por la atebrina compuesta.—*Medicina Paises Cálidos*. Madrid. 1936. June. Vol. 9. No. 6. pp. 269-283. With 1 chart. [54 refs.]

VAN WAARDENBURG (D. A.). Over een geval van zwartwaterkoorts behandeld met biocholine.—*Geneesk. Tijdschr. v. Nederl. Indië*. 1936. Apr. 21. Vol. 76. No. 16. pp. 1001-1004.

RABIES.

A REVIEW OF RECENT ARTICLES. XXVI.*

A number of papers have appeared in which the transmission of rabies by the vampire bat is discussed. The first of these by VERGE and GORET¹ is for veterinary consumption and deals mainly with the historical and geographical aspects of the problem. It appears that epizootics of paralytic rabies have been observed throughout a belt of country extending from Trinidad in the North, through the central parts of Brazil, and the Matto Grosso, and reaching the sea in the south on a front extending from San Paulo to Monte Video.

In the second TORRES and LIMA² report further experimental work carried out at Rio de Janeiro. This is a lengthy paper dealing with the examination of the virus obtained from bats, its properties, the symptoms of infection in the bat, the disease in cattle, and the existence of bats which are "carriers" of the disease.

The third, also by TORRES and LIMA,³ deals with rabies in the bat, the course of the disease, the virulence of the saliva, the transmission of the disease from bat to bat, and the pathological changes found in the brain.

In the fourth by PACHECO and PROENÇA,⁴ it is reported that the virus can be found in the blood of infected animals, and that the disease can be transmitted by injection into the veins.

In the section on Rabies in the *Boletín de la Oficina Sanitaria Panamericana*⁵ the whole question of cattle epizootics in South America, and the transmission of the disease by the bat is summarized. In addition to this there are reviews of various papers relating to rabies in general, and in particular to the incidence of rabies in South America.

"Since the British occupation of Tanganyika Territory no case of human or dog rabies has been confirmed. In the German records 3 cases of dog rabies are reported, but so far a search of the records has failed to reveal a case of human rabies." During 1933 and 1934 several suspicious cases of rabies in animals occurred, and two human deaths were reported, but in no case was the diagnosis confirmed. In 1935 a European officer died of rabies in Edinburgh whilst on leave from Tanganyika Territory. A case is now reported from the Central

* For the twenty-fifth of this series see 1936, Vol. 33, p. 742.

¹ VERGE (J.) & GORET (P.). Sur un nouveau mode de transmission de la rage. A propos des épizooties de rage paralytique transmise par la morsure des vampires.—*Rec. Méd. Vét. Exot.* 1936. Apr.-June. Vol. 9. No. 2. pp. 41-54. With 4 figs. [38 refs.]

² TORRES (Sylvio) & LIMA (E. Queiroz). La rage et sa transmission par les vampires.—*Rev. Gén. de Méd. Vét.* 1936. Aug. 15. Vol. 45. No. 536. pp. 449-478.

³ TORRES (Sylvio) & LIMA (E. de Queiroz). A raiva nos morcegos hematóphagos. (*Desmodus rotundus murinus*).—*Rev. Depart. Nac. da Produção Animal.* Rio de Janeiro. 1935. Vol. 2. Nos. 4, 5 & 6. pp. 385-396. With 10 figs. English summary.

⁴ PACHECO (Genesio) & PROENÇA (M. Cavalcanti). O vírus da raiva bovina do Brasil circula no sangue e se pode transmitir por via sanguínea. (Nota previa.)—*Brasil-Médico.* 1936. Aug. 1. Vol. 50. No. 31. p. 661.

⁵ BOLETÍN DE LA OFICINA SANITARIA PANAMERICANA. 1936. May. Vol. 15. No. 5. pp. 473-477.—Rabia.

Province by WILSON and SINGH.⁶ The diagnosis was confirmed by the presence of Negri bodies.

The prevalence of rabies during 1935 in Cuba is discussed by ARENAS MARTORELL and HERRADA LLIBRE⁷ (see also this *Bulletin*, 1936, Vol. 33, p. 324). Charts show that "the epidemic" reached a maximum during the month of February.

According to BAKER, McALPINE and DOWLING,⁸ rabies is becoming increasingly prevalent in the southern States of America. In Florida the number of dogs' brains examined and found to be positive during the years 1929-1934 was 4,256, and the average annual increase was computed to be 15.6 per cent. In Texas the number was 2,757 and the annual percentage increase 16.8. Similar though lesser rates of increase occurred in Tennessee, Georgia and Mississippi, whilst in Florida there was a decrease of 29.1 per cent. Various statistics are given regarding the number of treatments issued, the location of the bite, and the occurrence of paralytic accidents (2 amongst 20,517 persons treated).

i. *Virus*.

The experiments of NICOLAU and KOPCOWSKA⁹ on the reconversion of fixed virus into street virus have been frequently referred to in these reviews (1934, Vol. 31, p. 637 and 1935, Vol. 32, p. 605). In these earlier experiments it was difficult to obtain an unbroken line of subpassages, as from time to time the nerve trunks injected proved to be avirulent. They then inoculated, in addition to the portion of nerve trunk, an emulsion from the related spinal ganglion. By this procedure difficulties were reduced but still failures were encountered. If a small fragment of lumbar cord is also added the results of inoculation are constant, passages are carried out with certainty, and the numbers of Negri bodies in the oculomotor nuclei and in the spinal ganglia increase steadily in number with subpassage. The procedure which they now adopt is to inoculate a fraction of this mixture into the sciatic nerve trunk.

The properties of the strain of fixed virus in use at Beirut have been examined by P. and A. MILLISCHER.¹⁰ The procedure adopted was that of REMLINGER and BAILLY, and the results are given in detail.

The characters of the Sassari virus are discussed by LÉPINE and SAUTTER.¹¹ As is well known, this strain of fixed virus is peculiar in that it is virulent when inoculated subcutaneously into laboratory

⁶ WILSON (D. E.) & SINGH (Hari). A Case of Human Rabies in the Central Province of Tanganyika—*East African Med. J.* 1936. Sept. Vol. 13. No. 6. pp. 185-186.

⁷ ARENAS MARTORELL (Rogelio) & HERRADA LLIBRE (Manuel). Estado actual de la rabia en Cuba. (Segunda comunicación.)—*Medicina de Hoy*. Habana. 1936. Sept. Vol. 1. No. 8. pp. 313-318. With 2 figs.

⁸ BAKER (J. N.), McALPINE (James G.) & DOWLING (J. D.). Rabies: a Continuing Challenge.—*Southern Med. J.* 1936. June. Vol. 29. No. 6. pp. 547-555. With 7 figs.

⁹ NICOLAU (S.) & KOPCOWSKA (L.). Passage en série, de nerf à nerf, chez le lapin, du virus rabique fixe; récupération de la "negrigenèse."—*C. R. Soc. Biol.* 1936. Vol. 122. No. 18. pp. 280-282. With 1 fig.

¹⁰ MILLISCHER (P.) & MILLISCHER (A.). Expertise du virus rabique fixe utilisé à Beyrouth.—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 626-632.

¹¹ LÉPINE (P.) & SAUTTER (V.). Aptitude negrigène du virus fixe de Sassari.—*C. R. Soc. Biol.* 1936. Vol. 122. No. 20. pp. 542-544. With 2 figs.

animals. The authors find that numerous well developed Negri bodies appear in the usual situations in rabbits inoculated with the Sassari fixed virus. It thus behaves with regard to negrigenesis as a street virus. Its characters have not changed during 1,700 subpassages occupying a period of 36 years. But initially the Sassari strain emanated from Paris. It was introduced into Sassari in 1900, and after 25 to 26 passages it had increased in virulence not only for the rabbit but for the mouse. It now differs profoundly from the parent strain. There has been no parallelism between the two collateral branches of the same fixed virus, that subpassaged in Sassari and that subpassaged in Paris.

Using graded collodion membranes for ultrafiltration GALLOWAY and ELFORD¹² record results as to the dimensions of rabies fixed virus (Paris strain). As the result of a series of experiments they find that active filtrates were obtained after filtration through membranes of porosities varying from 0.5μ to 0.25μ . "Even under the most favourable conditions, no virus was detected in filtrates from membranes of A.P.D. 0.2μ , and this porosity is therefore taken as the filtration end point." This leads the authors to "assign a value of 100–150 $m\mu$ for the particle diameter of the virus of rabies." This result is in accordance with that reported by YAOI, KANAZAWA and SATO (this *Bulletin*, 1936, Vol. 33, p. 743), who found that the end point for a Japanese strain of fixed virus was also 0.2μ .

In a second paper, ELFORD and GALLOWAY¹³ deal with the dimensions of AUJESZKY's virus. The end point in this case is also 0.2μ indicating a particle size of the virus of 100–150 $m\mu$.

From experiments conducted by JONNESCO,¹⁴ it appears that pancreatic juice in a dilution of 1 in 10 may destroy rabies virus, but the effect is variable. This action is stated to be due to the action of the tryptic ferments of the juice, as if these all neutralized by the anti-tryptic ferments of normal serum, there is no longer any indication of destructive action.

From experiments carried out by MACKAY and SCHROEDER¹⁵ it appears that aqueous solutions of urea kill the rabies virus with ease. Two rabbits given 0.1 and 0.2 cc. of untreated virus suspension intracerebrally died with incubations of 6 and 8 days respectively. Of 4 rabbits inoculated by the same route with 0.1 up to 0.3 cc. of urea treated rabies virus none developed the disease. The urea treated virus contained 50 per cent. of cord-brain, and 40 per cent. of urea.

ii. Symptomatology.

A case of paralytic rabies in which the interval between onset of symptoms was much prolonged (22nd January till 4th February) is

¹² GALLOWAY (I. A.) & ELFORD (W. J.). The Size of the Virus of Rabies ("Fixed" Strain) by Ultrafiltration Analysis.—*Jl. Hygiene*. 1936. Oct. Vol. 36. No. 4. pp. 532–535. [11 refs.]

¹³ ELFORD (W. J.) & GALLOWAY (I. A.). The Size of the Virus of Aujeszky's Disease ("Pseudo-Rabies," "Infectious Bulbar Paralysis," "Mad-Itch") by Ultrafiltration Analysis.—*Jl. Hygiene*. 1936. Oct. Vol. 36. No. 4. pp. 536–539. [13 refs.]

¹⁴ JONNESCO (Démètre). Action du suc pancréatique (homme) sur le virus rabique.—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 43–46.

¹⁵ MACKAY (Eaton M.) & SCHROEDER (Charles R.). Virucidal (Rabies and Poliomyelitis) Activity of Aqueous Urea Solutions.—*Proc. Soc. Experim. Biol. & Med.* 1936. Oct. Vol. 35. No. 1. pp. 74–76.

reported from Saigon by VAUCEL and HOANG-TICH-TRY.¹⁶ The course of the disease was in all respects similar to that of a previous case at Saigon described by DOROLLE, CHAUSSINAND and TRAN-VAN-TAM (this *Bulletin*, 1935, Vol. 32, p. 608.). The diagnosis of rabies was confirmed both microscopically by the presence of Negri bodies, and by animal inoculation. The affection commenced on 22nd January with fever, anxiety and headache. On the 26th weakness of the upper limbs was observed. Thereafter the course was that of an ascending paralysis.

A case of hydrophobia which at the onset showed the symptoms of a transverse myelitis is reported by ROY.¹⁷

A case of rabies which occurred on the 12th day after completion of a course of treatment by Semple's method is described by GUPTA.¹⁸ It was first diagnosed as a post-vaccinial paralytic accident, but later the usual symptoms of rabies developed.

iii. Pathology.

MANOUÉLIAN¹⁹ extends his observations on alterations in the nerve cells in rabies (this *Bulletin*, 1936, Vol. 33, p. 320). Neurons during the course of infection show marked alterations, and are ultimately destroyed and disappear. A large number of nerve cells are encroached upon by satellite cells. These proliferate and finally occupy the space of the original neurone, thus forming the nodules of van Gehuchten. But where hypertrophy of the neurofibrils has occurred this is not the case. It appears that the neurofibrillary network strongly resists destruction.

LEVADITI and SCHOEN²⁰ report further observations on the presence of negri bodies in the corneal epithelium. It appears that in corneal epithelium, regenerated after previous destruction by croton oil, or radiation by a mercury vapour lamp, negrigenesis occurs more actively and more constantly than in normal corneal epithelium, whether the infecting dose of rabies virus is given by scarification of the cornea, or intracranially. They add that they have found negri bodies in cells of the corneal epithelium which are in the stage of mitosis, which proves that the rabies infection does not hinder karyokinesis.

iv. Methods of Treatment.

A very important pronouncement is made by REMLINGER and BAILLY²¹ in a contribution presented to the Academy of Medicine. They commence by quoting from a letter from Pasteur to Duclaux. "The interest which vaccination with *non virulent* medulla would

¹⁶ VAUCEL (M.) & HOANG-TICH-TRY. Évolution lente d'un cas de rage paralytique.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. June. Vol. 14. No. 6. pp. 681-684.

¹⁷ ROY (A. C.). Hydrophobia simulating Acute Transverse Myelitis at the Onset.—*Indian Med. Gaz.* 1936. June. Vol. 71. No. 6. p. 339.

¹⁸ GUPTA (S. C. Sen). A Case of Paraplegia and Hydrophobia following a Full Course of Anti-Rabic Treatment.—*Indian Med. Gaz.* 1936. Nov. Vol. 71. No. 11. p. 660.

¹⁹ MANOUÉLIAN (Y.). Nodules rabiques et réseau neurofibrillaire.—*C. R. Soc. Biol.* 1936. Vol. 123. No. 29. pp. 494-496. With 3 figs.

²⁰ LEVADITI (C.) & SCHOEN (R.). Négrigénèse cornéenne et régénérescence épithéliale.—*C. R. Soc. Biol.* 1936. Vol. 122. No. 21. pp. 616-618.

²¹ REMLINGER (P.) & BAILLY (J.). Contribution à l'étude de la vaccination anti-rabique par les vaccins phéniqués.—*Bull. Acad. Méd.* 1936. June 9. 100th Year. 3rd Ser. Vol. 115. No. 22. pp. 788-793.

excite need not be emphasized. It would be a scientific fact of the first order, and an inestimable advance in the method of prophylaxis of rabies." The authors continue: "Vaccination by dead virus was foreseen by Pasteur himself, was instigated by him. It results directly from his immortal discovery." "It is only just to recall that the honour of the first application of phenol to the attenuation of rabies virus belongs to Fermi, and that vaccination by phenol vaccines is inseparable from his name." A description of the virus employed by the authors is then given. It is a 5 per cent. emulsion, containing 1 per cent. phenol, filtered through gauze, and then heated at 37°C. for 24 hours. It is a Semple vaccine. "We should note that if the percentage of phenol is less than 0.75, and if incubation at 37°C. for 24 hours is not carried out, the vaccine is capable of infecting a rabbit, when $\frac{1}{2}$ cc. is injected subdurally. Does this imply that when inoculated under the skin of man or dog there would be danger of infection? Far from it. We are persuaded that the contrary is the case. Nevertheless, in countries such as Africa and Western Europe, where rabies virus has usually only a feeble aggressibility it appears preferable for human vaccination at least, only to employ vaccines which have been rigorously killed."

The authors then relate certain comparative experiments carried out by themselves on rabbits, dogs, and an ass, of which the results were satisfactory. They then quote the reviewer's finding from the statistics furnished to the League of Nations, that no superiority of living over dead vaccines could be detected. This, they continue, is in agreement with their experimental results. They then compare cord and killed phenol methods of treatment categorically and in detail, and conclude "these experiments and the statistics furnished from the numerous institutes, even for wolf bites, ought to attract serious attention. No method of vaccination is more practical and better adapted to the necessities of modern life." This paper is of far-reaching importance, and should be read in the original. It would appear that the efforts of the Health Section of the League of Nations in summoning a Conference in 1926, at which a large mass of evidence was put forward, and in collecting statistics during the succeeding years, have not been in vain. It is to be hoped that this decision of REMLINGER's will clarify the situation, and that his aspiration that the treatment of rabies may be standardized will take concrete form in the near future. As the reviewer has so often emphasized, the treatment of rabies by fixed virus, in whatever form it may be exhibited, is the treatment of Pasteur.

An experiment on the comparative immunizing powers of Fermi's original carbolized vaccine (*i.e.*, kept for 24 hours at 20°C.) and Semple's modification (*i.e.*, kept for 24 hours at 37°C.) has been carried out by MULAS.²² The result may be summarized as follows:—

Of 18 rabbits which had received an infective dose of 0.25 cc. of Sassari virus subcutaneously and were treated by Semple's method (2 to 4 cc. of a 5 per cent. vaccine daily) commencing after intervals of one, three and five days, one survived (*i.e.*, 5.5 per cent.).

Of 18 rabbits similarly treated by Fermi's vaccine, 10 survived (*i.e.*, 55.5 per cent.)

Of 8 untreated rabbits none survived.

²² MULAS (F.). Valeur comparée de la méthode de Fermi et des autres vaccins phéniqués pour la vaccination antirabique. Inefficacité des modifications apportées à la méthode originale.—*Rev. d'Hyg. et de Méd. Préventive*. 1936. June. Vol. 58. No. 6. pp. 419-426.

From this result the author claims that the Semple modification is only one-tenth as effective as Fermi's original method. He quotes also the figures of an early experiment on the same point by Fermi himself (for the figures see this *Bulletin*, 1928, Vol. 25, p. 711), but in this case the contrast was not so striking, the relative efficiencies of the two vaccines being of the order of 6 to 10. What is essentially the same paper appears in an Italian Journal,²³ with a slight and somewhat naive change of title.

A slightly different experiment on the same subject was carried out by COVELL, MCGUIRE, STEPHENS and LAHIRI.²⁴ In this case the treatment was pre-infectious. Duplicate vaccines were prepared, of which one was incubated at 37°C. for 24 hours and the other was kept at room temperature. 30 monkeys were immunised with incubated virus, and 30 with unincubated. Both groups received a daily dose of 2 cc. of 5 per cent. emulsion for 14 days, and 3 weeks after completion of treatment the monkeys of both groups together with 30 untreated monkeys received an infecting dose of 2 cc. of a 2 per cent. emulsion of street virus in the muscles of the neck. The result was as follows:—

Of 25 monkeys treated with incubated vaccine none died of rabies.

Of 27 monkeys treated with unincubated vaccine none died of rabies.

Whilst of 36 untreated, 11 died of rabies.

The experiment was repeated with the following result:—

Of 39 monkeys treated with incubated vaccine one died of rabies.

Of 39 monkeys treated with unincubated vaccine none died of rabies.

Of 40 untreated monkeys 23 died of rabies.

From these results the authors conclude that "no significant loss in efficiency is produced by incubating carbolized 5 per cent. antirabic vaccine at 37°C. for 24 hours." It is to be noted that in the experiment carried out at the Indian Laboratory the treatment was pre-infectious, whilst in that carried out at Sassari it was post-infectious. In spite of this difference, however, it seems difficult to reconcile the two results.

A further series of experiments by COVELL and his co-workers was carried out to elucidate the question as to whether antirabic serum as an adjunct to treatment by carbolized vaccine increased protection. Though carried out on a large scale (260 monkeys) the results were inconclusive.

The authors quote the results of a similar test on human cases carried out by SHORTT, MCGUIRE, BROOKS and STEPHENS (this *Bulletin*, 1935, Vol. 32, p. 610), from which they conclude that the results "suggest that antirabic serum adds to the value of carbolized vaccine in preventing the onset of rabies, but many more cases must be treated before a definite opinion can be expressed on this point."

[As remarked, in reviewing that paper, the results do not indicate a significant difference between the two methods of treatment.]

In the second section of their paper they show that the immunizing value of carbolized vaccine prepared from the spinal cords of sheep is very much less than that prepared from the brain.

²³ MULAS (F.). Dannose ed assurde modificazioni inglesi al metodo antrabbico Fermi.—*Boll. Istituto Sieroterap. Milanese* 1936. Sept. Vc. 15. No. 9. pp. 576-580. French summary.

²⁴ COVELL (G.), MCGUIRE (J. P.), STEPHENS (E. D.) & LAHIRI (B. N.). Notes on Antirabic Immunization.—*Indian J. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 373-388.

In a third section of this paper it is shown that of 70 guineapigs inoculated subdurally with 0.2 cc. of seven samples of Semple's vaccine selected at random from stock, none developed rabies. Thus the vaccine employed at Kasauli contains only dead virus.

In their fourth section they show that the immunizing properties of the Kasauli vaccine are retained unimpaired for 7 months, in the ice chest.

A further section deals with the correlation between complement fixation tests and immunity to rabies. The sera of 131 monkeys (survivors from a previous experiment) after a 6 months' interval were examined for complement fixation. These monkeys were then given a second infecting dose to test their resistance. The results were as follows:—

Complement fixation.	Number of Sera.	Deaths.
Strong positive ...	36	5
Weak positive ...	38	2
Incomplete ...	16	1
Negative	41	6
	<hr/> 131	<hr/> 14

From this result they conclude that "the complement fixation test is not an accurate means of gauging immunity response in connection with antirabic treatment."

In a final section they state that they have been unable to detect any superiority of virus fixed in the dog, over virus fixed in the rabbit or sheep, in the protection of dogs from rabies (*cf.* JONNESCO this *Bulletin*, 1933, Vol. 30, p. 142).

Using antisera prepared from rabbits and goats, HOYT, FISK, MOORE and TRACY²⁵ have conducted a series of experiments upon the passive immunization of rabies. When large intraperitoneal injections of antiserum were given before intracerebral virus inoculation, a higher percentage of 188 treated mice (36 per cent.) survived than of the 247 corresponding controls (9 per cent.), and in addition the mean incubation period was lengthened by the treatment. When antisera were given 16 days before or shortly after the infecting dose there was no evidence of protection. When on the other hand the sera were given intracerebrally half an hour before an intracerebral infecting dose protection was marked (19 out of 26 mice survived, as compared with 5 out of 59 controls). But when given either 24 hours before or 2 hours after, it was ineffective.

Using their "protection test" previously described in these reviews (this *Bulletin*, 1935, Vol. 32, p. 178) REICHEL and SCHNEIDER²⁶ report experiments which show that resistance against rabies infection is increased after treatment by killed phenol rabies vaccines, as compared with phenolized normal brain substance.

²⁵ HOYT (Anson), FISK (Roy T.), MOORE (Frederick J.) & TRACY (Ralph L.). Experimental Rabies in White Mice II. Studies on Passive Immunization.—*Jl. Infect. Dis.* 1936. Sept.—Oct. Vol. 59. No. 2. pp. 152–158.

²⁶ REICHEL (John) & SCHNEIDER (J. E.). Response to Rabies Vaccine Prophylaxis as shown by Protection Tests.—*Amer. Jl. Public Health.* 1936. Aug. Vol. 26. No. 8. pp. 789–792.

Of 510 persons treated at the Pasteur Institute of Paris²⁷ during the year 1935, none developed rabies.

Symptoms and pathological appearances of a case of paralytic accident of the Landry type are described by CH'EN and CH'ENG.²⁸ These were of the usual type, and the authors state that their histological findings were indicative of a toxic degenerative process.

v. Rabies in Animals.

The rôle of wild carnivora in the transmission of rabies was discussed by THOMAS and NEITZ²⁹ at the South African Health Congress, held at Cape Town in February, and the question of the possibility of controlling the prevalence of meerkats was considered.

The work of REMLINGER and BAILLY³⁰ on the transmission of rabies to various birds is well known. They now report observations of rabies in the stork (*Ciconia ciconia*). Using street virus they have been able to transmit the disease to two storks by subdural inoculation. The symptoms were those of paralytic rabies, without any indication of excitability. Diagnosis was confirmed by animal inoculation.

vi. Miscellaneous.

In continuation of former work on fixed virus (this *Bulletin*, 1936, Vol. 33, p. 751) YEN³¹ shows that the Chinese hamster is also susceptible to street virus.

MILLISCHER and MARTEAU³² report that in certain experiments carried out with cords, dried for 2 days, and subsequently kept at 7°C. in the ice chest for periods varying from 12 to 158 days, a large proportion of the rabbits inoculated exhibited symptoms of excitability, approaching sometimes to fury.

TYNDEL and PASTERNAK³³ have failed to find confirmation of NIKOLIĆ's assertion (this *Bulletin*, 1936, Vol. 33, p. 326) that antirabic vaccines can be used with hope in cases of epilepsy. They used it on 10 cases without result.

A. G. McKendrick.

²⁷ VIALA (Jules). Les vaccinations antirabiques à l'Institut Pasteur en 1935.—*Ann. Inst. Pasteur*. 1936. June Vol. 56. No. 6. pp. 717-721.

²⁸ CH'EN (M. P.) & CH'ENG (Y. L.). A Case of Acute Ascending Paralysis Complicating Anti-Rabic Treatment.—*Chinese Med. J.* 1936. May. Vol. 50. No. 5. pp. 683-686. With 2 figs on 1 plate. [11 refs.]

²⁹ THOMAS (A. D.) & NEITZ (W. O.). Wild Carnivora as Carriers of Rabies.—*Jl. Roy. San. Inst.* 1936. June. Vol. 56. No. 12. pp. 754-760.

³⁰ REMLINGER (P.) & BAILLY (J.). Transmission de la rage à la cigogne (*Ciconia ciconia*).—*C. R. Soc. Biol.* 1936. Vol. 123. No. 28. pp. 383-385.

³¹ YEN (Albert C. H.). Experimental Virus Infections in Chinese Hamster. II. Susceptibility to Street Rabies Virus.—*Proc. Soc. Experim. Biol. & Med.* 1936. June. Vol. 34. No. 5. pp. 648-651.

³² MILLISCHER (P.) & MARTEAU (P.). Observations sur la congélation des moelles rabiques.—*C. R. Soc. Biol.* 1936. Vol. 122. No. 22. pp. 727-728.

³³ TYNDEL (M.) & PASTERNAK (M.). Zur Behandlung der genuinen Epilepsie mit antirabischen Vakzinen.—*Wien. Klin. Woch.* 1936. Aug. 14. Vol. 49. No. 33. pp. 1017-1018.

MISCELLANEOUS.

SMIT (H. P.). **Climate in South Africa.**—*South African Med. Jl.* 1935. Nov. 23. Vol. 9. No. 22. pp. 782-789.

This is a fairly detailed discussion on climatic conditions in South Africa as a whole and on climatic variations between different parts of the Union in particular. The maps and graphs described in the paper have been omitted as they have been published previously in the Year Book of the Union.

One of the author's objects is to point out the great variety of climates which occur in the Union of South Africa and to suggest the possibility of establishing new health resorts and centres for the treatment of diseases, should the need for these be indicated by the medical profession.

In addition to latitude the three principal climatic influences are: (1) the relative distribution of land and sea; (2) altitude above sea level and general topography; (3) ocean currents.

Conditions on the east and west coasts of South Africa form a striking contrast on account of the warm Mozambique current on the east coast and the cold Benguela current on the west.

The high temperatures associated with low latitudes are in South Africa generally offset by a considerable altitude above sea level. Rainfall, though heavy in parts of the Union, may be said to be less effective than rainfall in Great Britain on account of the heaviness of the showers and the hot dry periods between them. Mean temperatures, contrary to general opinion, do not vary very greatly from those found in England, but the diurnal temperature range is considerable.

The author concludes that the diversity of South African climates calls for more adaptation in diet, clothing and housing conditions, which European conservatism finds hard to adopt. He considers the white population to be too much ruled by European conventions to enjoy to the full the usually healthy climate in South Africa.

T. C. Angus.

ANNING (C. C. P.). **Tropical Sanitation: the Town.**—*Jl. Roy. San. Inst.* 1936. June. Vol. 56. No. 12. pp. 787-800. [Summary appears also in *Bulletin of Hygiene.*]

The present and future public health problems in towns of the tropics and subtropics of Africa concern the non-white sections of the population, and the education of this section is best done by well trained people of the same colour and social background. The interdependence of the white and other races in the town, and that of the town and country is illustrated by reference to the vital statistics of Pietermaritzburg. While only about 15 per cent. of white deaths are put down to preventable disease, 50 per cent. of non-white deaths are attributed to such disease. Since February 1934 all male natives entering the town have been medically examined and up to November 30th, 1935, 3.97 per cent. were refused registration on account of infectious disease, mostly venereal disease or tuberculosis.

A housing survey showed that of all houses marked for demolition on account of their insanitary state only one per cent. were occupied by whites, although the white and non-white populations are equal. Several reasons are given to explain why it is that the rural native tends to become a slum dweller on entering a town, and requires

re-education in hygienic principles to meet his altered environment. The town owes a good deal of its disease to incomers from the rural areas around; these may be human carriers of disease, and such things as rodent carriers of plague, or the insect vectors of malaria.

As regards the last point it is remarked that prior to 1929 *Anopheles costalis* was not reported in the town, but thereafter it and malaria occurred annually, in increasing amount from January to May, till 1932 when action was taken. The steady advance of *costalis* up the river into the town from the rural areas lower down and nearer the coast, is illustrated by a table giving dates of capture of anophelines and cases of malaria. The adult anophelines were discovered in huts by the use of insecticides a week before larvae could be found by intensive search for breeding places.

Nine cases of typhus, attributed, with some reserve, to flea agency, were found in the town during the year.

The Pietermaritzburg Municipal Native Village points the way to the solution of the greater part of the native disease problem; brick buildings each with its own garden, proper sanitation, purified water supply, adequate ventilation and sunshine inlet, with washing areas, and a controlled market.

D. B. Blacklock.

ROSS (G. A. Park). **Tropical Sanitation in its Application to Native Reserves.**—*Jl. Roy. San. Inst.* 1936. June. Vol. 56. No. 12. pp. 801–806. [Summary appears also in *Bulletin of Hygiene*.]

Dr. Ross insists that disease prevention in native areas is not effected by providing medical aid; the public health needs of towns are not met by practitioners, hospitals, clinics and dispensaries, and what applies to towns applies equally to the country. In the native reserves organization under his control, the duties which would ordinarily fall to a European sanitary inspector in a European area, are done by educated natives, while the supervising and organizing duties of a head inspector are done by European sanitary inspectors under the medical officers. The author found that the Zululand natives could be educated to the extent of believing that lice are responsible for their typhus, and of washing themselves as required. In Natal the Berg people are dirty and have much typhus, but he finds that they can be taught by educated people to rid themselves of lice. Trained members of the native staff, living with native chiefs, can induce the natives to deal with outbreaks themselves, naphthalene oil and soap being distributed in convenient places. The author is optimistic as to the prospects of education in hygiene and disease prevention in these native areas.

D. B. Blacklock.

ORENSTEIN (A. J.). **Tropical Sanitation in its Application to Organised Industry in South Africa.**—*Jl. Roy. San. Inst.* 1936. June. Vol. 56. No. 12. pp. 777–786.

WERNER (H.). **Zur Frage der Akklimatisation der Weissen im tropischen Hoch- und Tieflande. Deutsche Siedlung in Espirito Santo (tropisches Brasilien). [Adaptation of the White Man to Tropical Climates. Germans in Espirito Santo.]**—*Deut. Med. Woch.* 1936. Aug. 7. Vol. 62. No. 32. pp. 1304–1306.

The tropical regions include 45 per cent. of the total of the earth's surface and the question is raised as to whether they should be regarded

any longer as unsuitable for the white race on account of climate and unhealthy conditions. It is pointed out that this is a matter of very great interest to Germany in view of future colonial expansion.

Particular attention is called to two German colonies which were established in Espirito Santo, a State on the coast of Brazil between Bahia on the north and Rio de Janeiro on the south. One of these colonies was formed by a group of 38 families numbering 163 persons from the Rhineland who landed at Victoria, the chief port of the State, in 1847. They went inland partly on foot and partly by canoe and after clearing the ground settled. During the next few years they received additions from Germany. In 1855 a private company sent out 1,000 persons consisting of Germans, Swiss and Tyrolese, who formed the colony of St. Leopoldina. In 1915 the total numbers of these two colonies was 17,000 to 18,000, which had developed in three generations from between two and three thousand immigrants. The increase was found to have taken place in the lowlands as well as the highlands. The employment was mostly growing maize and coffee, rearing cattle and breaking up new ground. It was found that work could be carried on for eight hours a day with a long rest midday. There was a system among these colonists called "Bittarbeit" under which if one of them wished to build a house or undertake some work which was beyond him he could ask the assistance of his neighbours and this had to be given without pay, but similar help would be given in return when required.

Malaria, yellow fever, enteric, dysentery and hookworm disease were effectively dealt with, but many women died in childbirth. Snake bites and accidents in the forests were among the causes of death.

The constitution of the colonist was found to have in no way deteriorated after several generations. They were of good physique and retained their German characteristics.

A. J. Collis.

PEACOCK (W. H.). **Presidential Address on the Training and Place of Auxiliary Health Staff in Tropical Colonies.**—*Jl. Roy. San. Inst.* 1936. Nov. Vol. 57. No. 5. pp. 299-305.

Dr. Peacock writes from his experience in two African colonies, Sierra Leone and Nigeria. In tropical Africa it would be far too costly to employ more than a nucleus of Europeans on the medical and sanitary staff. In Nigeria, for example, with a population of 20,000,000, the total strength of the Colonial Medical Service does not exceed a hundred. It will be necessary for many years to maintain some European health officers and sanitary inspectors for administration and for supervision and training of an African staff.

In Lagos there has existed for years a centre for training African sanitary inspectors for service with the Government and the local town council and a few for native administration areas. Their syllabus is a wide one and includes instruction in parasitology, entomology, communicable and epidemic disease, disinfection, disposal of refuse and night-soil, drainage, water supplies, ventilation, rat destruction, meat and food inspection, village sanitation, vaccination, clerical duties in keeping records and vital statistics, also elementary meteorology, police court duties and sanitary law.

The fact has been realized for some time that one training centre was not enough and schemes have been approved for three more—one for the Northern Provinces at Kano, and two for the Southern Provinces,

one at Ibadan (for Yoruba provinces), the other at Umuahaia (Owerri Province, for the Ibo and Effik districts). The last was opened in 1934.

Native administration inspectors are engaged chiefly in the work of rural sanitation—in the network of native administration village dispensaries which, in recent years, have sprung up all over Nigeria. By the end of 1934 there were 231 of these dispensaries, 96 in the Northern and 135 in the Southern Provinces. They are staffed by dispensary attendants trained at the larger hospitals. They provide the people with simple treatment, medical and surgical, and so gain their confidence. The idea is to make them in time real local health centres and to provide a full health staff of sanitary inspectors, vaccinators, midwives and health visitors.

In 1930 a school of medicine was established at Lagos on the lines of those at Mulago and at Khartoum. After a course of 5 years, two devoted to clinical work, approved candidates receive certificates entitling them to practise medicine, surgery and midwifery in the Government service. When a "medical assistant," as he is then called, has been registered for at least 3 years, one of which has been spent in an approved course of special study, and has passed a further examination, he is granted a diploma which entitles him to be called a Licentiate of the School of Medicine, and he may then be placed on the local register as a medical practitioner.

The course for students of the Lagos Health Department in public health, tropical hygiene and infectious diseases is very thorough and these students are likely to play an increasing part in public health work in Nigeria. A certain proportion of them will be available for rural health work in the dispensaries and they will act as house surgeons at the hospitals and so set free the European medical staff for health work in their districts.

The training of midwives is all-important and doubtless thousands of lives could be saved by antenatal care and proper midwifery. The Midwives Ordinance of Nigeria (1930) recognizes two grades: Grade I. Certificated women who have undergone a course of training in nursing and midwifery for at least 2½ years in an approved school. The first six months are spent in a preliminary course in general nursing at an African general hospital, after which training at a recognized midwifery training centre begins. Grade I certificate holders can practise midwifery anywhere in Nigeria. Grade II are partially trained midwives, of illiterate type. Their training is obtained at mission hospitals recognized by the Midwives Board. This period of training is at least six months; their examination is oral and practical only. Those who pass are registered for practice only in the area where they were born or have resided for not less than ten years. It is hoped that they will displace the "Mother Gamp" type practising in rural districts to the no little danger of the community.

H. H. S.

BLACKLOCK (Mary G.). Certain Aspects of the Welfare of Women and Children in the Colonies.—*Ann. Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. pp. 221–264. [Summary appears also in *Bulletin of Hygiene*.]

It is impossible in a brief summary to do justice to this long and important paper, which should be read in the original by all who are

interested. It was written after a visit to the East as the holder of a Leverhulme Fellowship. The author has also had considerable experience of health work amongst women and children in India and West Africa.

Early activities in the colonies during the stage of development were chiefly the concern of men. Consequently the first schools and hospitals were almost exclusively for males. Missionaries did something to redress the balance, as the women Missionaries took part in the education and medical care of women and girls. This paper describes the present position in the colonies, draws attention to some unsatisfactory aspects and makes suggestions for improvements. An account is given of certain recent developments for the training of health visitors, nurses and midwives.

While the general standard of medical work in most of the colonies is high, this is by no means always the case as regards women and children. There is often a grave disproportion between the number of male and female patients receiving treatment at the hospitals. There are Mohammedan districts in which no woman medical officer is employed. Welfare work is sometimes left mainly to voluntary effort.

Native women are apt to be frightened by the officialdom of large hospitals and the appointment of women as reception clerks is recommended.

Dissociation of welfare work from hospital work is often a cause of failure.

The education of girls and women from a public health point of view is discussed and the author commends the Jeanes system of education for villages in primitive communities. By this method the teacher and his wife receive practical health training and are then posted to a village in which they are expected to raise the standard of the community by example and precept.

An account is given of an interesting school in Nigeria in which girls of marriageable age are given practical training in domestic economy and hygiene under village conditions together with a little elementary education.

Greater attention should be devoted to training native women teachers, especially in the practical study of health problems and their solution, and more time should be given to the teaching of hygiene, domestic science and mothercraft in girls' schools.

Wireless broadcasting will play an important part in the future in the education of women in the villages.

Organizations for women are needed to take the place of the original tribal societies in which women have always played a prominent part. Women's branches of co-operative societies may be used for this purpose.

In many colonies better planned efforts are needed for the training of nurses, midwives and health visitors, and two grades may be necessary. An important activity of the welfare centres should be to train and supervise uneducated local women for these purposes. More women doctors are needed in the colonies and women should be appointed as special advisers on medical work for women and children. Local women should also be trained as medical assistants or doctors.

In every colony there should be some organization charged with the welfare of women and children to study social problems affecting them.

W. H. Peacock.

HENRY LESTER INSTITUTE OF MEDICAL RESEARCH. Annual Report 1935.—86 pp. With 9 figs. on 5 plates. 1936. Printed by N.C.D.N. Shanghai.

This report records a year of much activity. No fewer than 75 publications are listed in the Appendix and only a fraction of the work can be noticed here. The Introduction indicates its scope. In the Clinical Division the study of beriberi has been continued and in that of Physiological Sciences factory diets. "Dr. Read and his colleagues have shown through their analysis of the vitamin content of Chinese food that instinct and custom when not interfered with by modern civilization provide an adequate amount of these necessary dietetic principles." [Though this would appear obvious there are, it seems, authors who think otherwise.] In the Division of Pathological Sciences an advance has been made in the analysis of the antigenic structure of the typhoid bacillus and in the preparation of a serum for treatment. Dr. MAXWELL has done valuable work on leprosy. This Division conducts field investigations, especially in entomology and parasitology and the section on Field Medical Research in China is particularly interesting. In this part of China there is a huge fertile alluvial plain, intensively cultivated for generations. It is intersected by a network of waterways most of which are navigable by the countless small craft of the region. A vast population spends its entire existence afloat and the waterways abound in fish, crustaceans and molluscs, most of which are used for food. The situation favours mosquito breeding and malaria and filariasis are prevalent. The return of excreta to the soil keeps many helminthic diseases going such as schistosomiasis japonica, paragonimiasis and fasciolopsiasis.

Extracts from a collecting trip diary give an idea of the work that is being undertaken.

The Department of Epidemiology and Medical Statistics has concerned itself with the analysis of in-patient and out-patient records provided by the hospitals co-operating in the Chinese Medical Association Hospital Survey; in 1934 malaria was one of the major causes of morbidity. An investigation of printing works showed that conditions were bad and it was concluded that industrial hygiene is "almost hopeless of attainment in the absence of government regulation of industry." The Division of Clinical Research and Experimental Surgery has made considerable progress in the study of disordered nutrition as seen in the beriberi syndrome. An important chemical change in the blood is the accumulation of carbonyl compounds, especially of pyruvic acid, the amount of which may be determined from the bisulphite binding capacity and follows the degree of Vitamin B₁ deficiency as determined by clinical criteria. A practical indication from the work is that enormous doses of Vitamin B₁ are required for effective treatment in the more severe grades of B₁ deficiency.

The Division of Physiological Sciences has concentrated upon nutrition problems—Chinese diets and the vitamin content of Chinese foodstuffs.

The Division of Pathological Sciences has directed its attention to the local diseases or the parasites which cause them. In the work on the sero-diagnosis of typhoid it was found that the standard Widal technique using "H" suspensions alone may lead to an erroneous positive in nearly 20 per cent. of cases, and it is important that "O" antigen be used, especially where facilities for blood culture are lacking. A new

curative serum was prepared, based on the finding of a new "Vi" antigen in *Bact. typhosum*; 24 cases have been treated with encouraging results.

A large amount of section cutting was done for hospitals outside Shanghai. From the results of the examination of livers from cases of splenomegaly at Foochow it is believed that schistosomiasis is here in question, which would be a new record for this infection. A search is to be made for infected molluscs.

The writer points to the possibility of destroying the fecundity of *Oncomelania* snails by means of single-tailed cercariae, which is being explored. In the work on filarial transmission it was found that matured filarial larvae in mosquitoes infected in the latter part of the autumn were not able to survive the winter in their hosts. A tabulated record of the examinations made at the Institute concludes the Report.

A. G. Bagshawe.

KENYA COLONY AND PROTECTORATE. Medical Research Laboratory Annual Report, 1935 [CORMACK (R. P.), Senior Bacteriologist].—27 pp. 1936. Nairobi: Govt. Printer.

This report indicates that heavy routine demands were made upon all divisions of the Institute.

Research has included the typing of pneumococci, with prophylactic and therapeutic tests of pneumococcal vaccines specially prepared for local use. The records, given in brief, are so far inconclusive.

In an intensive investigation of the South Kenya endemic plague area, no evidence was found that plague existed in the *field* rodents, nor that any spread was occurring from that area. It has been noted that in the native reserves the rats, which live chiefly in the thatched roofs of the huts and therefore do not need to enter the hut in order to reach the villagers' cereal stores outside, harbour *X. brasiliensis* only. This has been deduced, no doubt correctly, to be a factor associated with the lower human mortality in plague outbreaks in native reserves compared with that in urban areas. In the townships, although the rats as a whole harbour a mixed flea population, many rats live underground, and these have been found to be infested with *X. cheopis* only. Such rats, and therefore fleas too, come into closer contact with the human inmates of the dwelling than do those in the native reserves.

A survey of the Colony as regards its schistosome-carrying snails has been started.

Epidemiological, clinical and serological features of "Tropical Typhus of Kenya" have been found to correspond very closely with those of "fièvre boutonneuse." Examination of the blood of 74 normal persons has demonstrated that the haemoglobin content shows an increase to be expected from the altitude of residence above sea-level, "but this has not in general been accompanied by an increase in cell count."

P. H. Martin.

CRUICKSHANK (Alexander). Tropical Diseases of the Southern Sudan : their Distribution and Significance.—*East African Med. Jl.* 1936. Sept. Vol. 13. No. 6. pp. 172-177.

The country in question lies to the south of 10° N. lat. and is peopled by negroid tribes; the population is 1½ millions and the area 200,000 square miles.

Malaria, chiefly malignant tertian, is universal (splenic index 90–100 per cent.), blackwater fever is sporadic. *Human trypanosomiasis* occurs along the south-western border where French Equatorial Africa and Belgian Congo lie; last year 92 cases were diagnosed. *Yellow fever*.—One case has been recognized and the mouse protection test showed 17 out of 30 to be positive at Rumbek and a smaller proportion elsewhere. *Amoebic dysentery* is widespread, liver abscess rare. *Leprosy* is rare in the north-east among the cattle owners, and common in the great fly belt, 98 in 950,000 as against 6,944 in 643,000. A census of the Zande tribe showed 3·9 per cent. to be infected. There are now 2,368 lepers in 11 settlements. *Yaws* has much diminished owing to energetic treatment; it is still prevalent in remoter areas.

Of helminthic infestations: *Schistosomiasis mansoni* is common in the south-west and of mild type. Seventeen per cent. of admissions at Li-Rangu harboured this parasite. *Filariasis*.—The forms recognized are *A. perstans*, *Loa loa* and *O. volvulus*. *Loa loa* is found in the country bordering French and Belgian territory; at Li Rangu hospital 38 per cent. of 681 male hospital admissions and 20 per cent. of 369 female admissions harboured this parasite. *O. volvulus* has a wider distribution and produces subcutaneous nodules, skin eruptions, elephantiasis of the genitals, hydrocele and eye lesions, including total blindness. *Dracontiasis* is found patchily over most of the area. Prophylactic measures in the Yei district have almost banished it. An emulsion of the local heglig berries (*Balanites*) is used for killing cyclops in wells and pools. *Ankylostomiasis* is "reaching serious proportions," affecting the whole area west of the Nile. Among the Dinka herdsmen anaemia, ascites and other symptoms are seen. *Hydatid* disease occurs on the Abyssinian border.

Tropical sloughing phagedaena affected 60–70 per cent. of over a million out-patient attendances. The author has little doubt that dietary deficiency is the main predisposing cause. After thorough cleansing bandages soaked in the ordinary gum arabic of the country are applied over an ointment dressing and left on 10–14 days.

Kala azar is found on the Abyssinian border; in 1935, 49 cases were admitted.

Epilepsy of unknown origin is frequent. The author postulates a parasite.
A. G. Bagshawe.

PERVÈS (M.). Observations sur la pathologie du Hoggar (Taman-rasset 1933–1934). [*Observations on the Diseases of the Hoggar Country, Sahara.*]—*Arch. Inst. Pasteur d'Algérie*. 1936. June. Vol. 14. No. 2. pp. 206–220. With 4 figs. on 1 plate.

A paper on medical practice in this region, which lies within the tropic line, was summarized in this *Bulletin*, 1934, Vol. 31, p. 327.

The climate is influenced both by the Sahara and the Sudan but the dominant note is dryness, the hygrometric average being 27 per cent. The district is isolated by the desert, the nearest centres of population are some 20 days' march away, so that epidemics of short incubation are rare.

Among the nomads affections of the lungs and joints are most frequent, among the settled folk eye diseases. The pathology is

Mediterranean rather than tropical. The following are topics of interest :—

In 1933 and 1934 there were seasonal epidemics. The first was characterized by short development, three days fever and general pains followed by marked asthenia, fatality nil, nomads spared ; the second was more severe with rigors, intense headache and photophobia, and bronchitis : some old people and children died of broncho-pneumonia. Both epidemics occurred in April after the spring rains. Owing to its altitude the country is unfavourable to malaria. Sources of infection are present and several species of *Anopheles*. Two indigenous cases were diagnosed, unconfirmed by microscope. Venereal diseases are common, syphilis so much so as to threaten the Touareg race, especially the nomads. Among 135 cases there were noted, 4 chancres, 30 skin eruptions, 9 mucous lesions, 57 osteoarticular forms, 11 ocular syphilis, 3 congenital syphilis ; later this is stated to be general. Syphilitic affection of the joints is the rule ; of 60 cases with systems of rheumatism 57 yielded to antisyphilitic treatment ; three varieties are described. Notes and illustrations are given of six cases of juxta-articular nodules, five of which benefited from antisyphilitic treatment. The frequency of eye affections is attested by the fact that of 5,416 consultations 3,018 were for that cause—conjunctivitis of all types, trachoma (rare among the nomads), interstitial keratitis. Chronic bronchitis, in which “ the rôle of syphilis is certain ” is frequent. It appears that while the medical service of the stations is sufficient the nomads get little advantage from it and should be provided with a doctor who would spend his time on tour. *A. G. Bagshawe.*

GIORDANO (Mario). Uno sguardo alle attuali condizioni sanitarie dell'Eritrea. [Review of Health Conditions in Eritrea.]—*Rev. Parasit., Clin. y. Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 355-366. English summary.

Malaria is common towards the end of the rainy season, late winter and early spring, in the eastern plains, the vectors being *A. mauritanus* and *A. costalis*. Drainage and other prophylactic measures have been started and in 6 months there were 142 cases, but none fatal. Phlebotomus is present also, and three-day fever is seen. Ticks are plentiful, 22 species have been described. Here *Ornithodoros moubata* conveys relapsing fever and *Rhipicephalus simus* tick-bite fever. On some relapsing fever patients the author found lice also with spirochaetes, so that relapsing fever is both tick- and louse-borne in Eritrea. *Xenopsylla cheopis* was found, but no case of plague has been recorded. *Tunga penetrans* is said to have been imported from Somaliland a quarter of a century ago. Snakes of poisonous species are present, notably *Echis carinatus*, *Bitis arietans* and *Atractaspis irregularis* among Viperidae, and *Naia haje*, *N. nigricollis* and *N. sputans* among Colubridae. A polyvalent serum is kept. Dysentery, both amoebic and bacillary occurs, but is less frequent than formerly ; leishmaniasis and yaws are occasionally met with ; leprosy is common among the natives. *Taenia saginata* infestation is not infrequent owing to the habit of the natives of eating insufficiently cooked beef. A few cases of guinea-worm were also encountered. *H. H. S.*

CHIODI (Valfredo). Brevi cenni nosografici dell' Etiopia. [Notes on the Diseases of Ethiopia.]—*Giorn. Ital. di Malat. Esot. e Trop.* 1936. Aug. 31. Vol. 9. No. 8. pp. 157-160, 163. [14 reits.]

The author states that "the valorous troops of Italy having definitely obtained possession of vast tracts of Eastern Africa" a rich field of study is opened up. He divides the country into three zones: (1) The plains with gentle undulations, with an average temperature of 30°C. and a maximum of 42° in the shade. (2) Temperate levels to some 2,000 metres, with average temperature of 18°C., rarely rising to 30° and occasionally falling at night to 0°C. (3) Cold mountainous regions, about 2,400 metres, where population and vegetation are scanty.

Malaria is common; subtertian particularly, and various clinical types—dysenteric, bilious remittent, haemorrhagic and haemoglobinuric, cerebral, etc.—are seen. *Smallpox* though not often epidemic is almost constantly present, and easily spread by the nomads who live in squalor. Vaccination is not general, and is often refused. *Leprosy* is widely prevalent, nodular, anaesthetic and mutilating types being met with. *Human trypanosomiasis* is little known; *G. morsitans* and *G. palpalis* are rare, but *G. pallidipes* fairly common. Animal trypanosomiasis is better known, *T. congolense*, *T. brucei*, *T. pecorum* and *T. evansi* (particularly in camels, says the author). *Tuberculosis* is fairly widespread, and the pulmonary form runs a rapid course; surgical forms constitute about 10 per cent. of the total cases. *Relapsing fever* is "moderately diffuse," due to *Sp. duttoni* transmitted by *O. moubata*. *Venereal diseases* are a "veritable plague"; *skin affections* due to *Tinea* of several species also common. Parasitic infestations include hookworm, *Trichuris*, *Ascaris* and *Enterobius*, *Schistosoma* [? *haematobium*], *Filariasis*, and *Dracontiasis*. Several species of venomous snakes are found, notably *Echis carinatus*, *N. naja*, *psammophis* and *sepedon*.
H. H. S.

CARRILLO GIL (Alvar). Dos enfermedades por carencia en Yucatán. I. Notas clínicas sobre la xerofthalmía en Yucatán. II. Notas sobre la avitaminosis llamada "culebrilla" en Yucatán. [Two Deficiency Diseases in Yucatán. I. Clinical Notes on Xerophthalmia. II. Culebrilla, a Form of Avitaminosis met with in Yucatán.]—pp. 1-31. With 12 figs.; 33-58. With 10 figs. 1935. Mérida, Yucatán, Mexico. [Summary appears also in *Bulletin of Hygiene*.]

I. The first of these two articles is based on a study of 109 cases seen in the Children's Hospital, Mérida. Xerophthalmia has for some years shown an increasing prevalence. Dietetic errors are doubtless at the basis of the trouble, but poverty, hunger, and intestinal diseases, in particular dysentery, play no inconsiderable part. Besides definite xerophthalmia, depicted in several striking photographs, other indications are not wanting—pallor, defective development, oedema, keratosis, ocular ulceration and staphyloma.

II. The word "culebrilla" was originally applied to any skin disease of the ringworm type, but has in more recent years come rather to be limited to an avitaminosis occurring among those living largely on maize. Some of the children affected are very wasted and cachectic, others show oedema more or less widespread, but particularly involving the legs; in some there is a purpuric eruption and local ulceration with necrosis or gangrene of the skin of the knees or elbows occurs. Which

of the vitamins is deficient to produce this is not quite certain ; some authors have ascribed it to lack of A, B and C, but others find that A, C, and D are adequate, some part of the vitamin B complex being deficient. The illustrations in this article are very descriptive. [See *Bull. of Hyg.* 1935, Vol. 10, p. 806.] H. H. S.

HERMANS (E. H.) & SCHOTMAN (J. W.). Exotische aandoeningen in Nederland. III. Pellagra. [*Exotic Affections in Holland. III. Pellagra.*—*Nederl. Tijdschr. v. Geneesk.* 1936. Aug. 8. Vol. 80. No. 32. pp. 3661-3669. With 6 figs. on 1 plate. English summary (7 lines).

Pellagra is, of course, by no means limited to the tropics or even warm climates, as many believe, and the interest of this case lies in the fact that from the description and the illustrations (which are exceedingly good) this was a genuine case and the first, it is said, to be reported from Holland. The patient was the wife of a sailor or boatman ; her age was 25 years, she lived in the country and came under observation on account of her mental condition—a dull state thought at first to be of an hysterical nature, but was of a schizophrenic type and did not wholly clear up. No fault, in the way of vitamin deficiency, could be discovered in her diet. The onset seemed to be in relation to the puerperium—altogether a puzzling case. H. H. S.

MALDONADO. Champ d'action de la "Verruga" péruvienne ou maladie de Carrion. [*Verruga peruviana or Carrion's Disease.*—*Arch. Méd. Belges.* 1936. Oct. Vol. 89. No. 10. pp. 631-658.

A general account of *Verruga peruviana* with greater detail of the disease in the valley of the Ste. Eulalie river. The author, who is a naturalist, describes the topographical, climatological and phytological features of the country. He notes that *Verruga* is most prevalent where the vegetation comprises many lactiferous shrubs and plants. Euphorbiaceae (Agaves), Julianaceae and Moraceae on the slopes ; Euphorbiaceae of other species, Papaveraceae and Asclepiadiaceae in the valley. Even after the leaves have fallen *Phlebotomus* find in these plants abundant sustenance while the dead leaves are nourishment for the larvae. The most heavily infected valleys are narrow, shady and tortuous, with plentiful vegetation in the first half of the year, rainfall in the first quarter, and *Culex* and *Anopheles* are abundant as well as *Phlebotomus*. Three species of the last occur : *P. noguchi* Shannon, a certain transmitter, *P. verrucarum* Townsend, a possible, and *P. peruensis*, a doubtful transmitter. They are nocturnal insects, biting furiously at night, hiding in the interstices of rocks in the beds of the river and watercourses and in the walls of the cultivated terraces.

H. H. S.

KUYPERS (C. A.). Piedra in West Borneo.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1936. Sept. 15. Vol. 76. No. 37. pp. 2344-2356.

In this article abundant evidence is forthcoming of the existence of Piedra, a disease well known in Columbia and Brazil, also in West Borneo. The nodules which are characteristic of the disease are thickly set upon the terminal parts of the hair. When the hair is

stroked it feels sandy (hence the name Piedra, sand). Twenty cases were discovered among 230 Dajak men. Two forms were discovered, one with black nodules and affecting men and the other with grey-white nodules affecting mainly women, but also occasionally cultivated out of the black Piedra. Microscopically black nodules are shown to consist of a mass of large polygonal yellowish green to light brown cells with a definite cell wall. The cells of a mycelial thread are separated from one another by thick black cell walls, between which is a little intercellular light yellowish substance. By pressing on the cover glass of a caustic potash preparation the peripheral cysts are burst and the spores are set free from the nodule. Cultures can be obtained fairly pure after some two hours' treatment of the hair in absolute alcohol; the medium on which they are grown is Sabouraud's agar with the composition:—agar 25; glucose 40; peptone 10; distilled water 1,000. Incubation was at room temperature which varied from 25°C. to 35°C.

As a result of the work done in West Borneo "it appears that two Piedra forms are common, the one with black nodules in which asci with ascospores belonging to a black fungus and closely corresponding to *Trichosporon hortai*, the other with grey-white nodules caused by a grey-white fungus resembling *Trichosporon giganteum*. . . . It is almost certain that these black and white fungi are, in a botanical sense, entirely different types and cannot be included in one species."

W. F. Harvey.

Fox (Howard). **An Unproven Case of Pinta originating in Ceylon.**—*Jl. Trop. Med. & Hyg.* 1936. June 1. Vol. 39. No. 11. p. 125.

This is a short, but timely, criticism of a misleading tendency to arrive at a diagnosis of Pinta on inadequate evidence. The mere presence of coloured patches in places with depigmentation elsewhere and the cultivation of a mould, *Aspergillus*, are insufficient. The author states that, according to the findings of the Mexican Commission in 1929, a Wassermann positive reaction is as frequently given as in yaws or syphilis, in fact in about 98 per cent. of cases. The fungi cultivable from the skin of patients with pinta are unrelated to the disease, and the idea that different coloured pintas were due to different fungi was discarded in Mexico. The aetiological relationship of the fungi isolated to the disease is excluded for the following reasons enumerated by the author:—

"(1) In endemic regions numerous fungi (especially *aspergillus* and *penicillium*) can be cultivated from the normal skin of cases of pinta as well as from the skin of normal persons.

"(2) Cultures of fungi are usually obtained from scaly areas.

"(3) When patients with pinta change their residence to non-endemic regions the fungi usually disappear from the skin though the pigmentary changes persist.

"(4) With one doubtful exception the disease has never been reproduced in man or animal by inoculations of cultures of fungi obtained from patches of pinta.

"(5) It is difficult to understand how a superficial infection of the skin (horny layer) could cause a positive Wassermann reaction and how such an infection could be made to disappear by antisyphilitic treatment.

"(6) The occasional appearance of extensive unilateral pinta would almost preclude a local infection of the skin by fungi."

H. H. S.

PARDO-CASTELLO (V.). Pinta o carate en Cuba. [Pinta in Cuba.]—*Rev. Parasit., Clin. y Lab.* Habana. 1936. Sept.-Oct. Vol. 2. No. 5. pp. 667-675. With 7 plates. [11 refs.]

The author gives an introductory account of pinta, its history, causation, symptomatology, pathology, and treatment by bismuth and neosalvarsan. In a terminal section he considers the question of the relation of pinta to syphilis and concludes that although the pathological histology is different, there are several "points of contact" between them, notably the positive Wassermann reaction, the results of treatment by bismuth and arsenic (antisyphilitic remedies), and the frequency of cardio-vascular lesions. A history of syphilitic infection is not usually obtained and the author suggests that the relation of pinta to syphilis is similar to that between yaws and the same disease.

H. H. S.

ALLEN (F. R. W. K.) & DAVE (M. L.). The Treatment of Rhinosporidiosis in Man based on the Study of Sixty Cases.—*Indian Med. Gaz.* 1936. July. Vol. 71. No. 7. pp. 376-395. With 5 figs. [91 refs.]

The authors' summary and conclusions are as follows :—

" 1. Rhinosporidium has been assigned by Ashworth to the lower fungi (*Phycomycetes*) such as the *Chytridineae* and has been provisionally placed near the *Olpidiaceae*.

" 2. In man, cattle and equines it causes an exfoliative, non-infiltrating granuloma usually situated in the nose, but also occurring in the pharynx and larynx, on the fauces and uvula, in the ear and lacrimal sac, on the conjunctiva and the mucous membrane of the glans penis and on the skin.

" 3. The occurrence of these granulomata have been reported from Asia (India, south of a line joining Bombay and Benares, Ceylon, the Philippine Islands and possibly China, Japan and the Malay States), from North America (the United States), from South America (the Argentine, Paraguay and Uruguay), from Africa (the Union of South Africa), and from Europe (Lombardy). It seems probable that the distribution is much wider than this, cases being overlooked.

" 4. The mode of infection is not known but transmission by either water or dust appears to be probable.

" 5. The authors have given reasons for believing that natural cure may sometimes take place.

" 6. Diagnosis is easy and consists of noticing the minute white sporangia on the surface of the growth and of finding the spores, containing the characteristic 10 to 16 refringent spherules, in stained smears of the secretion therefrom.

" 7. Sixty cases, investigated by the authors, are reported.

" 8. The treatment of early single growths in accessible situations is simple and consists of clean excision of the growths together with the surrounding areas of healthy mucous membrane or skin.

" 9. Treatment of the growths in inaccessible situations and of multiple growths is not so satisfactory. It consists in excision of the growths, the employment of the electric cautery for the destruction of the surrounding areas of infected mucosa and of the injection of 2 to 4 grammes of neostibosan (Bayer) in 0.3 gramme doses intravenously (adult dose) with the object of trying to kill the parasite.

" 10. The authors' cases have not been followed up for a sufficiently long period of time to enable any absolute cures to be claimed but the results reported appear to be promising.

" 11. Neostibosan is not effective in all cases and therefore a more powerful parasiticide is required, preferably one of which a single dose will prevent the development of the spores into sporangia.

" 12. Sulphostab (Boots), casbis (Bayer), entodon (Bayer), foudadin (Bayer) and paranitrophenol have been tried by the authors, and urea stibamine (Brahmachari) has been tried by Norrie in isolated cases without encouraging results.

" 13. Two patients stated that a snuff composed of pounded tobacco leaves and lime was bringing about a cure and their claim seems to be supported by the pathological report. This line of treatment, even if proved to be sure, would be very slow."

H. H. S.

CIFERRI (R.), REDAELLI (P.) & SCATIZZI (Ida). Unità etiologica della malattia di Seeber (granuloma da *Rhinosporidium Seeberi*) accertata con lo studio di materiali originali.—Reprinted from *Boll. d. Soc. Med.-Chirurg. di Pavia*. 1936. Vol. 14. No. 5. 24 pp. With 4 figs. on 1 plate. [57 refs.]

AIISO (M.) & HAYASHI (N.). **Pathologic-Anatomical Studies of Kaschin-Beck's Disease.**—*Jl. Oriental Med.* 1936. Sept. Vol. 25. No. 3. [In Japanese pp. 467-500. With 22 figs. (2 coloured) on 8 plates. [31 refs.] English summary pp. 49-51.]

Beck's disease is defined as a condition "marked by fatigue and swelling of the phalanges; later all the joints of the body become enlarged and normal growth is retarded." KASCHIN first noted it as long ago as 1850, though it was not described in any detail till BECK gave an account of it in 1906. It appears from recent researches to be endemic from north Chosen to Manchoukuo. The authors' investigations into the pathological anatomy may be summarized thus:—

1. The most noteworthy changes are in bones and joints, but inflammation of the alimentary tract is always found.

2. The joint lesions are least in the shoulder, worst in the fingers; swelling of joints and shortening of the bones are significant. The synovial membrane shows papillomatous proliferation, but no excess of fluid nor loose bodies are seen.

3. Synostosis of tarsal and carpal bones is not uncommon; the joint surfaces are porous and the ends flattened. The medullary cavity is dilated (rarefied).

4. The marrow is fatty and fibrous, the latter arising from destruction of bony tissue. Deposits of iron are present.

5. The bone becomes spongy from dilatation of Haversian canals, which often contain fibrous tissue.

6. The articular cartilages show both degenerative and proliferative changes, and ulcerative processes may be seen on the articular surfaces.

7. Senile changes occur in the costal, tracheal and thyroid cartilages and blood capillaries invade the perichondral tissue.

8. The alimentary mucosa shows infiltration by lymphocytes and eosinophiles; there may be an atrophic gastritis. The large intestine and stomach give a fairly marked reaction for iron, slight in the small intestine.

9. Iron is deposited also in the Kupffer cells and interstitial cells of the liver and in the spleen.

10. Hyaline and granular casts occur in the renal tubules, and the walls of the glomerular arteries are thickened.

11. In short the changes in bones and internal organs are of a senile character; the abundance of inorganic iron appears to be closely related, but the cause is still unknown. H. H. S.

AIISO (M.) & HAYASHI (N.). **The Quantity of Iron contained in the Blood in Kaschin-Beck's Disease.**—*Jl. Oriental Med.* 1936. Sept. Vol. 25. No. 3. [In Japanese pp. 513-525. English summary p. 52.]

Following up their studies on the morbid anatomy and histology of Kaschin-Beck's disease the authors have studied the iron content of the blood of these cases. In a normal man the amount is between 0.54 and 0.67 mgm. per 100 cc., with an average of 0.62. In one living in the endemic area [between Chosen and Siberia] the average is 0.58, with extremes of 0.4 and 0.69 mgm. More than two-thirds of 64 patients (45) showed a content above 0.7 mgm. One volunteer was given Ferrum redactum and his blood examined over a period of 50 days. It was observed that the blood-iron gradually increased, and then, in spite of the continued administration, gradually decreased. The authors infer that inorganic Fe plays an important rôle aetio-logically. H. H. S.

TESSITORE (C.) Un caso di *Acanthosis nigricans* presso i baboma dell' Africa Centrale. [*Acanthosis nigricans in a Woman of a Central African Tribe.*]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Jan. Vol. 17. No. 1. pp. 49-51.

The condition, first named by UNNA, is characterized by papillary hypertrophy and hyperchromia, runs a chronic course, developing in advanced age, and affecting chiefly the face, the neck, axillae, breast, elbows, flexures of the knees, and dorsa of hands and feet. The condition is rare and the case here described is the first seen by the author in 13 years' practice, 7 of them in Africa. Its aetiology is unknown; at one time it was held that there was some connexion between it and cancer for among 13 cases, 5 suffered with carcinoma of the stomach, 3 of the uterus and one of the breast. The patient whose case is related here was a woman of 60 years, belonging to the Baboma tribe; she showed the condition as affecting the eyebrows and frontal region, the neck, axillae, elbows, dorsa of hands and fingers. Her general state of health was good. No cure is known, the only effective treatment is surgical removal and this is rarely feasible on account of the extent of the lesions. H. H. S.

AKAMATSU (A.) & TAKIYAMA (U.). **Prevalence in Hiroshima Prefecture of Dermatitis due to the Sting of Liponyssus Nagayoi, and the Result of Studies on the Characters of that Mite.**—*Jl. Public Health Assoc. Japan.* 1936. Apr. Vol. 12. No. 4. pp. 1-2.

The authors record widespread dermatitis associated with intense itching, most prevalent during the summer months, caused by the bite of *Liponyssus nagayoi*. This mite is a common parasite of the rat; the authors have found it also on bats. V. B. Wigglesworth.

MEAGHER (J. L.). **Epidemic Stomatitis in the Northern Solomons causing Rapid Death.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 251–254.

The outbreak here recorded occurred among the natives of a small island, Matsuhan, 6 miles from Buka Passage, New Guinea. The total population was "fifteen to eighteen all told," occupying four houses near the beach. They lived by fishing, trading fish for taros. There were six fatal cases, death taking place in some within 14 hours or so, in another not till the fourth day. The chief symptoms were sore throat and mouth, vomiting (in fatal cases), dysphagia, slight cough and a remarkably red tongue. There was no complaint of abdominal pain but an early symptom in some was marked feeling of weakness with malaise. There was no fever in the cases seen by Dr. Meagher, and the pulse and blood-pressure were normal or almost normal. One on the neighbouring island of Fatsigern (she had visited Matsuhan some said on the day of the outbreak) was seen 5 days after the onset of symptoms and by that time the lips were purple, cracked and swollen, tongue "red-raw." At the junction of hard and soft palates were scattered pin-point erythematous spots, coalescing towards the uvula. No other physical signs of any import were observed [the enlarged "firm spleen reaching to the umbilicus" can have had no connexion with the acute condition].

[The author unfortunately does not seem to have seen any patients in the earliest stages, nor is there any mention of autopsy. The information is too scanty to allow of more than conjecture. Even the population of the four houses is not known for certain, and the statement that they had not eaten any fish just prior to the outbreak cannot be accepted without reserve from a village whose inhabitants lived by fishing. The symptoms are strongly suggestive of a toxin, even of a toxic food (*cf.* the fruit of *Hippomane mancinella* for instance). More detailed histories, careful post-mortem examinations and probably experimental work will be needed to clear up the mystery.] *H. H. S.*

BONNE (W. M.) & NEUHAUS (K.). Vergiftiging door de steek van een visch. [**Poisoning from the Sting of a Fish.**—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1936. Sept. 22. Vol. 76. No. 38. pp. 2402–2405. With 1 fig. on plate.

The fish poisoning here referred to is not from a bite but was effected through a special apparatus. On either side of the rays of the dorsal fin of *Synanceia verrucosa* are small hollow canals, which are ducts leading to poison sacs. The poison is limpid and slightly acid.

The case described is of a woman who was occupied in cleaning an aquarium and who was stung in the process by a fish. Her symptoms seem to have been extreme local pain, swelling of the punctured thumb and extension of this swelling up to the elbow, irregularity of the pulse, some cyanosis and an inclination to sleepiness. Slight incisions were made into the thumb and the wound treated with ammonia. Pain and swelling remained prominent symptoms for some days but recovery was complete.

W. F. Harvey.

[*Synanceia verrucosa* is one of the Scorpaenidae (Scorpion Fish). Of this family there are several poisonous members. The poison apparatus, though connected with the dorsal fin, is not the same in all the varieties. Thus, in the *Synanceia* mentioned above, before the poison

can escape an enclosing membrane must be broken, whereas in the *Scorpaena* the poison apparatus is practically in direct communication with the exterior. The poison glands of both are situated at the base of the dorsal spines, but in the former the spines are grooved and a membrane makes this groove into a sac, and the poison cannot escape until the sac is ruptured, whereas in the latter the spines are channelled with an opening near the tip. Members of the *Synanceia* group are widely distributed.—*Ed.*]

PLUM (Preben). **Accuracy of Haematological Counting Methods.**—*Acta Med. Scandinavica*. 1936. Vol. 90. No. 4. pp. 342-364. With 12 figs. [2 pages of refs.]

This article is of fundamental importance and does not admit of abstract. Haematologists should consult the original. The author begins with an historical sketch of the development of blood-counting methods during the past hundred years and discusses their accuracy or want of it, the errors being due either to unequal distribution of the corpuscles in the counting chamber or smear, or to faulty measuring of the blood and diluent. He shows by experiment that the former of these plays the chief part in errors of individual counts, whereas the latter plays a relatively small part. The mean error in counting-chamber counts is equal to the square root of the number of cells counted; the mean error in differential count on a smear regarded as properly made may be calculated by Bernouilli's theorem $m = \sqrt{n \cdot p \cdot q}$. He gives a diagram of the calculated mean error in differential counts of 100 to 1,000 leucocytes.

H. H. S.

HYNES (M.) & MARTIN (L. C.). **A Rapid Method of measuring Erythrocyte Diameters.**—*Jl. Path. & Bact.* 1936. July. Vol. 43. No. 1. pp. 99-104. With 5 figs.

The authors describe a method of constructing a diameter distribution curve comparable to that used by Price-Jones, but performed in a much shorter time. The method consists fundamentally in the projection of the images of the erythrocytes on to a ground glass screen at 2,000 times magnification, and their direct measurement by a celluloid protractor described by Whitby and Britton in 1935. The Price-Jones method of counterstaining Romanowsky films with 5 per cent. aqueous eosin for 2 to 3 minutes is adopted. The optical system consists of a 100 candle-power Pointolite contained in a light-proof box, a lens system to condense the light on to a mirror of the microscope using a one-twelve inch oil immersion lens and a $\times 20$ eyepiece. The images of cells are transmitted from below on to the horizontal ground glass screen, extraneous sources of light being excluded by a conical black cloth. By use of this method the authors claim that the mean diameter and cell area figures may be obtained with a high degree of accuracy without pencil outlining, and that a considerable saving of time is ensured.

N. Hamilton Fairley.

COOMBS (Herbert Isaac). **Studies of the Haemoglobin and Iron of the Blood. I. The Determination of the Total Iron of Blood.**—*Biochem. Jl.* 1936. Sept. Vol. 30. No. 9. pp. 1588-1591. [11 refs.]

The author describes a method of estimating the total Fe content of the blood by the use of dipyrldyl. He uses the following reagents:

(1) Fifty per cent. H_2SO_4 . (2) Concentrated HNO_3 . (3) Forty per cent. (approximately) sodium acetate. (4) Twenty-five per cent. (approximately) solution of glucose. (5) Dipyrldyl reagent 0.468 gm. of dipyrldyl in 6 ml. of N hydrochloric acid made up to 100 ml. with distilled water. (6) Standard Fe solution. 0.35 gm. ferrous ammonium sulphate in distilled water containing a few drops of H_2SO_4 and made up to 100 ml. in a standard flask. It contains 50 mgm. of iron per 100 ml.

The method is thus described :—

" Measure exactly 0.1 ml. of blood into a pyrex tube which has a mark at the 10 ml. level. The pipette should be washed carefully with the minimum of water. Add 0.2 ml. of 50 per cent. sulphuric acid and about 10 drops of concentrated nitric acid. Heat carefully, with constant agitation, over a micro-burner until charring begins. Cool and add more nitric acid, repeating these operations until no further charring occurs. Boil off the excess of nitric acid. The residual drop of sulphuric acid usually contains a white precipitate which is probably anhydrous ferric sulphate. Add about 0.5 ml. of water and warm to dissolve this precipitate. Add 0.3 ml. of dipyrldyl reagent, followed by 1 ml. of glucose solution. Mix well by shaking and add 5 ml. of sodium acetate solution. Heat in a boiling water bath for 5 min. for full colour development. Cool and make up to the 10 ml. mark with distilled water.

" The standard is prepared in exactly the same way except that 0.1 ml. of the standard iron solution (or 1 ml. of a standard diluted ten times) is used in place of the blood.

" Compare in a colorimeter with the standard preferably at 25 mm. If U is the reading for the unknown and S the reading for the standard, then
$$\frac{S \times 50}{U} = \text{mg. of iron per 100 ml. of blood.} "$$

Normally, human blood contains about 50 mgm. of iron per 100 ml., and 0.1 ml. is enough for making the estimation, unless there is marked anaemia when this volume should be doubled.

The author has carried out some hundreds of analyses and has checked his findings in many ways ; he finds this dipyrldyl method very reliable.

H. H. S.

SYMONS (P. H.). **A Colour Index Calculator.**—*South African Jl. Med. Sci.* 1936. June. Vol. 1. No. 4. pp. 172–175. With 3 figs.

The author states that the instrument depicted in this paper has been devised and constructed because " the calculation of the large number of colour indices required in haematological practice is apt to prove exceedingly tedious."

For his calculations he takes the fundamental equation
$$\frac{H}{100} \times \frac{S}{E} = \text{C.I.},$$
 where H is the haemoglobin percentage, S the erythrocyte standard in millions per cmm., E the estimated erythrocyte number in millions per cmm. in the case in question, and C.I. the colour index. He states that a scale based on common logarithms would be more satisfactory, the equation becoming
$$\log H + \log S - \log E - 2 = \log \text{C.I.}$$

A circular rotating scale graduated on this basis proved satisfactory on trial ; next a cylindrical projection was also used with success, but these earlier instruments have now been simplified to a slide rule form clearly shown in an illustration.

[It all seems very simple, so simple in fact that the reviewer feels that he must have overlooked something, but if the erythrocyte standard is

accepted as 5 million per cmm., as the author does (though this is by no means generally held nowadays) and if the haemoglobin is registered as a percentage of a somewhat arbitrary standard (and this has been replaced by the more accurate "grams per cent."), then the simple

calculation of $\frac{H}{2E}$ (E being the first two figures of the estimated erythrocyte count) gives the C.I. as rapidly as the more elaborate logarithm and slide rule method.] H. H. S.

ANDRESEN (Marjory I.) & MUGRAGE (Edward R.). **Red Blood Cell Values for Normal Men and Women.**—*Arch. Intern. Med.* 1936. July. Vol. 58. No. 1. pp. 136–146. With 2 charts. [22 refs.]

The subjects of this investigation were 40 white men and 40 white women, between 20 and 45 years of age, who had been living in the district [? Denver; the place is said to be 5,000 feet above sea-level and the authors are Denver physicians, but the place of the investigation is nowhere mentioned] for at least two years; the number included physicians, medical students, technicians and office workers. The various findings are given in protocols; the results only can be indicated here:—

In all 240 samples of blood were examined as regards the number of erythrocytes, the volume of packed cells and the haemoglobin amount. The last was made in three ways, *viz.*, the Van Slyke-Neill manometric gas analysis to determine the oxygen-carrying capacity; the iron content of the whole blood, and estimation after conversion to acid haematin and the content of the Hb in grams calculated. The three methods yielded closely comparable results. The mean Hb value for the men was 16.54 gm. and 14.45 gm. for women per 100 cc. The mean packed cell volume per 100 cc. was 48.35 cc. and 43.22 cc. respectively, and the mean erythrocyte counts 5,420,000 per cmm. for men and 4,630,000 for women. The mean corpuscular Hb. value was 30.5 micromicrogram for men, 31.2 for women (Wintrobe's figures were 29.2 and 28.8 respectively) and the mean corpuscular volume, 89.2 cubic microns for men and 93.3 for women, was also above Wintrobe's average (86.5 and 87.0). The mean corpuscular haemoglobin concentration was 34.2 per cent. for men (Wintrobe gives 33.7) and 33.4 for women (Wintrobe gives the same)—evidence of the constant value of this is normal blood. Additional interest is obtained from a perusal of the author's findings because nearly all previous results have been recorded in those living at, or not more than 1,000 ft. above, sea level.

H. H. S.

HENNESSEY (R. S. F.). **Haematological Observations on Natives of Uganda.**—*East African Med. Jl.* 1936. Oct. Vol. 13. No. 7. pp. 210–215.

This haematological study was undertaken with a view to determining the standards for the normal healthy native in Uganda; the subjects were adult male convicts believed to be physically fit. The red corpuscle counts ranged between 3.5 and 6.25 millions, the mean being 4.56 per cmm., a figure some 17 per cent. below Price-Jones's figure (5.5) for Europeans. Haemoglobin was estimated by a Sahli instrument corrected by a new Hellige haemometer; the percentage ranged

between 70 and 115, with a mean of 95, an equivalent of 13.1 gm. per cent. The usually accepted European figures are a range of 12.4 to 17.0 gm., with a mean of 14.7. Here again, it will be seen, the native standard is below the European. The corpuscle diameter is greater, between 7.4 and 8.8 μ , with a mean of 7.88, the European mean being 7.17 μ . Less reliance is to be placed on leucocyte counts for the chances of small unrecognized infections are so great in the tropics. The author found the total to range between 5,400 and 12,600 per cmm. with a mean of 8,104. The European mean of Price-Jones is 8,007 with extremes of 2,002 and 14,013 (these were regarded as healthy subjects). The author suggests that the circulating haemoglobin of Uganda natives may be maintained at an efficient level by erythrocytes, fewer in total but larger individually, than those of Europeans. H. H. S.

DE MELLO (Froilano). Sur la genèse des altérations rencontrées dans le sang d'individus apparemment normaux de l'Inde Portugaise. [**Blood Changes in Apparently Normal Inhabitants of Portuguese India.**—Reprinted from *Medicina*. 1934. Nov. 13 pp.]

The author has recorded certain findings in the blood of 60 individuals in Portuguese India to all outward appearance healthy. He studied the total erythrocyte and leucocyte counts, a differential count of the latter, the haemoglobin percentage by the Gowers-Sahli apparatus, in three groups of 20 each, aged 7-14, 14-20 and 20-45 years. In the first the red cell counts ranged between 4,100,000 and 7,680,000; in the second between 5,000,000 and 8,400,000; in the third between 4,960,000 and 7,360,000, and the corresponding white cell limits 4,100 and 8,400; 4,100 and 9,800, and 4,100 and 8,300. In none of those below 14 years was the haemoglobin 100 per cent., the limits were 80 and 98, in the second group 72 and 100 and the third 74 and 100. An eosinophilia of 8 per cent. and over was found in 11 of those under 14 years, in 6 of the second group and 3 of the third. Relative lymphocytosis was present in all but three of the total, two in group 2, one in the third group. The author is of opinion that the eosinophilia is helminthic in origin and the lymphocytosis the result of latent malaria.

H. H. S.

NAPIER (L. Everard). **Tropical Macrocytic Anaemia.**—*Lancet*. 1936. Sept. 19. pp. 679-683. With 3 figs.

The author points out that the term tropical macrocytic (or megalocytic) anaemia, introduced by Dr. Lucy WILLS, has found its way into text-books without any very exact definition of either the clinical syndrome or the haematological picture that it represents. WILLS regarded the condition as a dietetic deficiency and distinguished it clinically from pernicious anaemia by the absence of both natural remissions and neurological features. The presence of free acid in the gastric secretion, the absence of hyperbilirubinaemia and of urobilinuria, the leucocytosis, the inversion of the polymorphonuclear-leucocyte rates and the absence of any right-hand shift in the Arneth count further differentiated the two diseases. The deficiency factor in the food of such patients was supplied by marmite or liver extract and appeared identical with Castle's extrinsic factor.

Excluding three cases of pernicious anaemia and two cases with sprue-like conditions, there were eleven cases of macrocytic anaemia in

the author's series which responded to treatment with marmite. Of these four were non-pregnant women and seven were men. The symptoms that brought the patients to hospital were referable to anaemia, *i.e.*, weakness, lassitude, shortness of breath and exhaustion on exertion. Nervous features were absent. A history of irregular fever was given by four patients with an enlarged spleen, but in no case was fever prominent. Malaria and kala azar were excluded. The haematological findings were similar to WILLS's tropical macrocytic anaemia except that the indirect van den Bergh reaction was positive in nine out of the eleven cases, the quantity varying from 1 to 3 units. There was other evidence of blood destruction including reticulocytosis which was most marked in cases with splenomegaly. The alcohol test meal showed hypoacidity in three, normal acidity in four and hyperacidity in two patients.

The reticulocyte response to marmite was inadequate, even in those more severely anaemic, though its therapeutic effects were striking. The author suggests that the submaximal reticulocytosis may have been due to inadequate dosage, while the action of marmite itself was attributed to its containing an independent haemopoietic principle which was also present in liver and probably other food substances as well. The cases, however, did not constitute a homogeneous group. One group in which there was evidence of dietary deficiency corresponded closely to WILLS's tropical macrocytic anaemia, whereas in the second group associated with splenomegaly, fever and reticulocytosis some haemolytic process appeared to be operative which brought about a relative deficiency in the specific haemopoietic (marmite) principle in people who are on a diet low though not actually deficient in this factor. It was suggested that the term "Bengal splenomegaly" might be applied to this group.

[An example of the disease now described by Napier under the title "Bengal splenomegaly" was recorded by the reviewer 2 years ago (*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934, XXVII, (563) under the heading "Rarer Forms of Megalocytic Anaemias encountered in Tropical Practice." This patient had never been further east of the Indian mainland than Delhi; he had spent several periods ashore in Bombay and once he had called at Calcutta, but had not left the ship. Whilst there are justifiable grounds for regarding the disease as a new entity, the term "Bengal splenomegaly" appears hardly appropriate on geographical grounds since the first case was described from the Punjab.]

N. Hamilton Fairley.

DHAR (Jyoti). Haematological Studies in Indian Women. (Part Five.) A Preliminary Report on the Determination of the Normal Reticulocyte Value in Eighty-Six Healthy Bengali Women.—*Calcutta Med. Jl.* 1936. Sept. Vol. 31. No. 3. pp. 132-154. [37 refs.]

The greater part of this article is devoted to a general account of the reticulocyte, of the literature on the subject, the structure and characteristics of the cells. The author's study is based on the percentages in 86 non-pregnant, to all appearances healthy, Bengali women between 16 and 35 years of age. No selection was made with reference to menstruation. He found that amongst his 86 subjects the average count was 0.945 per cent. of red cells, the highest count being 2 and the lowest 0.3 per cent. A very large proportion, 93 per cent., ranged between 0.3 and 1.4, which he consequently regards as the normal range

for Indian women. His average counts were considerably above those reported by other workers whose methods he deems less reliable than that employed by him, the method recommended by the American Society of Clinical Pathologists, using saturated alcoholic solution of brilliant cresyl blue and 1 per cent. neutral potassium oxalate in 0.85 per cent. sodium chloride solution. *H. H. S.*

WELLS (L. H.). Diurnal Fluctuations of the Leucocyte Count in Man.—*South African Jl. Med. Sci.* 1936. June. Vol. 1. No. 4. pp. 157–168. With 3 figs.

This will prove a very useful paper if it merely drives home the fact that very little information of value can as a rule be deduced from a single leucocyte count made at any time in the 24 hours. Fluctuations in normal subjects are great and change may take place within a brief interval.

The author's observations were carried out on young male adults, 22 series being obtained, and examinations being made when possible every fifteen minutes. Personal errors may have had something to do with the variations, but these are altogether too great to be thus accounted for. The detailed results are given in a table. The lowest count was 5,600; the majority were between 7,000 and 8,000 (9), next between 6,000 and 7,000 (7), two were below 6,000 and four above 8,000. The highest ranged between 10,600 and 22,100. In one subject there was a rise from 9,200 to 14,800 in half an hour; in another from 9,600 to 15,300 in three-quarters of an hour and in a third an even greater change, 5,900 to 18,500 in the same time.

There was clear evidence of a usual leucocytic tide with an ebb in the early morning and a flow in the early afternoon, but there were minor fluctuations of irregular occurrence. It was found that the fluctuations of the total leucocyte count did not follow those of the neutrophile count; the differential counts in this series, however, are not discussed in detail.

STAMMERS, who has also studied the question, ascribed the modification of the differential count to increased ultra-violet radiation, not to altitude alone, but to the combined effect of altitude and climatic factors. But Bantu subjects gave results closely similar to those of Europeans, and if the pigmented skin of the former is, as is believed, an efficient screen against U.V. radiation, the cause for the change in the leucocyte count must be looked for elsewhere. *H. H. S.*

KENNEDY (Walter P.) & MACKAY (Ian). The Normal Leucocyte Picture in a Hot Climate.—*Jl. Physiology.* 1936. Sept. 8. Vol. 87. No. 4. pp. 336–344. With 2 figs. [13 refs.]

Continuing their work on blood conditions in hot climates [see this *Bulletin*, 1935, Vol. 32, p. 528; 1936, Vol. 33, p. 480] the authors have investigated the leucocytic picture of 177 airmen and officers of the R.A.F. stationed at Hinaidi, men who had been in Iraq for at least a year and had good health records. For comparison they examined the blood of 32 airmen in Transjordan, 33 in Aden, 29 in Khartoum, and 29 Iraqi medical students from Baghdad. Altogether, therefore, there were 271 British airmen and 29 Iraqi students, under sub-tropical conditions.

They found that "neutrophils were relatively reduced, the monocytes increased, as compared with British standards. The polynuclear

count was deviated to the left. An unusually high number of 'abnormal' cells was found." Abnormal include cells promyelocytes, eosinophil myelocytes, macropolycytes, lymphoblasts and Türk cells and also erythroblasts. After consideration of possible factors, the authors conclude that the changes are probably due to climate.

H. H. S.

SHAW (A. F. Bernard). **The Polynuclear Count in Egyptians and British Subjects Resident in Egypt.**—*Jl. Path. & Bact.* 1936. July. Vol. 43. No. 1. pp. 165–172. [14 refs.]

Following the introduction of the polymorphonuclear count or Cooke and Ponder's modification of the Arneth count, recent researches have confirmed the work of earlier observers and shown that locality may have a decided influence in producing a left-handed deflection in the population compared to the European standard. In the present investigation blood films were fixed in methyl alcohol for 10 minutes and then stained with Giemsa 1.0 cc. in 10 cc. of distilled water for 20 minutes. The criteria of Cooke and Ponder for nuclear lobulation were strictly adhered to. Samples were collected between 9 a.m. and 10 p.m. A differential count of 500 cells was done in each case, but total leucocyte counts were not made. The Egyptian and British residents in Egypt both showed a marked left-handed deviation characterized by a relative excess of cells in classes I and II, and a relative deficiency in classes III, IV and V. Compared with KENNEDY's results for Britain these results proved statistically significant. There was, however, no significant difference between the Egyptians and the British domiciled in Egypt. Similar results have been obtained by KENNEDY and MACKAY amongst British airmen stationed in Iraq and the indigenous population. The fact that the count of British subjects domiciled in Egypt and Iraq conforms with that of the inhabitants of these countries, while differing from the count in Great Britain, indicates that the condition is environmental and not racial in origin. British subjects from Egypt within a few weeks assume the British type of count on arrival in England, but revert to the Egyptian type on returning to Egypt. [See also this *Bulletin*, 1936, Vol. 33, pp. 480, 803.]

N. Hamilton Fairley.

SALAH (M.). **Studies on Anaemias in Egypt. V. Acholuric Jaundice.**—*Jl. Egyptian Med. Assoc.* 1936. May. Vol. 19. No. 5. pp. 205–228. With 4 figs. on 1 plate.

The author describes three cases of familial acholuric jaundice in a mother and two daughters, and two cases of acquired acholuric jaundice. The familial group had all showed a tendency to haemorrhage since childhood. The first two patients were typical inasmuch as there was splenomegaly, anaemia, jaundice, increased fragility of corpuscles, marked microcytosis, high reticulocyte counts, high icterus index and urobilinuria. The third did not present the manifestations of the active phase of the disease but the haematological findings were characteristic. The author raises the question whether the association of acholuric jaundice and haemorrhagic diathesis in this family indicates a combined constitutional abnormality of both erythrocytes and platelets, or whether it suggests a constitutional hypersplenism leading to haemolysis and intermittently excessive

destruction of platelets. The low platelet counts in the first two patients manifesting evidence of haemolysis suggests the latter interpretation. Splenectomy without blood transfusion was performed in the first two patients with satisfactory results. The jaundice disappeared by the end of the first week, and the reticulocyte count became normal three to four days after operation. Haemoglobin improved and the diameter index showed a slow increase which started about the end of the first week. In contradistinction to the findings in thrombocytopenic purpura, though the platelet counts improved, the tendency to haemorrhage remained.

In the two cases of chronic haemolytic anaemia classified as acquired acholuric jaundice of Widal-Hayerns there was no increased fragility, no microcytosis and no family history. They resembled Cooley's type of erythroblastic anaemia as regards age, type of anaemia and splenomegaly, but the type of nucleated red cells were normoblasts, the erythroblast of the type met with in Cooley's anaemia being found only twice in Case I. The absence of changes in the short and long bones of the skull was regarded as the only point differentiating them from typical Cooley's anaemia of a similar age. *N. Hamilton Fairley.*

BLACKIE (W. K.). The Anaemia Problem in Southern Rhodesia.—*South African Med. Jl.* 1936. June 13. Vol. 10. No. 11. pp. 393-398.

In Southern Rhodesia disease, climate, diet and altitude play an aetiological rôle in anaemia which contributes to a subnormal state of health.

The diseases more directly concerned are malaria, blackwater fever and bilharzia. Malaria is almost entirely due to *P. falciparum* and the strains met with in Southern Rhodesia are capable of causing, either directly or indirectly, more severe degrees of chronic anaemia than those recently recorded by FAIRLEY and BROMFIELD in their London series. Chronic malarial gastritis may also predispose to anaemia. In blackwater fever sudden severe haemolytic anaemia is characteristic, and since routine blood transfusion has been adopted at the Salisbury Hospital the number of patients dying from anaemia has fallen to vanishing point. Bilharzia disease, though more insidious, is capable of giving rise to moderate degrees of anaemia—especially amongst children. *S. haematobium* is more common than *S. mansoni*, though both species are prevalent.

During the heat of the summer months free perspiration occurs and this has been shown to have a remarkably high chloride content. The blood chlorides tend to fall with reduction in the secretion of hydrochloric acid and consequent defective absorption of iron. The altitude is about 5,000 feet, but in assessing anaemic states no special allowance need be made for this.

Diet is important. A considerable proportion of Europeans—especially females—subsists on a diet containing minimal amounts of iron. Amongst Europeans the protein moiety of the diet is adequate to supply extrinsic factor, but instances of tropical macrocytic anaemia are occasionally encountered amongst the native races and are explicable on this basis; the disease responds adequately to liver extract and marmite.

Nutritional anaemia is by far the commonest type encountered: it is frequent in females of any age. Only three cases of idiopathic

hypochromic anaemia were met with and one of these presented a characteristic Plummer-Vinson syndrome.

The author concludes by urging a full haematological examination in medical, surgical and gynaecological cases in a country where anaemic states arise with such insidiousness. *N. Hamilton Fairley.*

CRANDALL (Noble F.). **Hemophilia in the Negro.**—*Trans. College of Physicians of Philadelphia.* 1936. 4th Ser. Vol. 4. No. 1. pp. 57–58.

The author has made a careful study of medical literature but has not discovered any account of haemophilia occurring in a negro. Hence, in that here recorded there is absence of the usual family history of "the hereditary tendency of males to bleed." The patient gave a history of excessive haemorrhages since early childhood [the age of the patient is not stated]. He developed hemarthrosis of the left knee. Coagulation time was tested on 13 occasions and was found abnormal on twelve. Five months after the bleeding stopped the coagulation time was still much prolonged. "The platelet count, the tourniquet test, the clot retraction, the Wassermann and Kahn tests were all negative," states the author [but he does not define what he implies by a "negative platelet count"; as a rule the platelet count is normal]. *H. H. S.*

Report upon Mosquito Control Activities, 1935, the Des Plaines Valley Mosquito Abatement District.—40 pp. [Summary taken from *Public Health Engineering Abstr.* Wash. 1936. Nov. 7. Vol. 16. Signed E. M. WATKINS.]

Mosquito annoyance during 1935 was the highest since the beginning of operations in 1928 in spite of the most complete control of breeding. Cloud-bursts caused larvae and pupae to go down the Salt Creek into the district, breeding then beginning in the flooded bottom lands. This is the first definite record of the river as a distributor of *Aedes vexans* larvae, and shows the necessity of keeping a close watch for the recurrence of conditions that would wash larvae or pupae into the river from back pools. During the middle of August the district received the worst flight of *Aedes vexans* it ever experienced. Prior to this flight, during the month of August, no rain of any consequence had fallen within the district. As all breeding areas were then under control and local breeding having been ruled out, it gave the assurance that the presence of mosquitoes was not the result of local breeding. Following this flight, four other major flights took place, two from the south and two from the west, which indicated that tremendous numbers of larvae had been breeding in the marshes to the west and south of the controlled area. The extensive drainage which has taken place in Stickney Township during the past few years and its effectiveness in withholding breeding in this area is the one indication that flight centers may be broken up. With the progress in drainage and the increased efficiency in oiling, the problem of mosquito flight becomes more in evidence and the eventual mosquito-proofing of the controlled district apparently depends upon the ability to stop the long flights from the west and the south.

Progress was carried on in temporary control operations during 1935 with relief labour forces, through the Illinois Emergency Relief Commission up to August 15th and with forces supplied by WPA after

that date. Figures are given showing work accomplished, together with a cost distribution summary of previous years and a more complete analysis for 1935.

The finding of *Anopheles punctipennis* in large numbers indicated control measures should be taken against this species, and Paris green dusting was inaugurated with gratifying success. Discovery of *Culex territans* and *Culex pipiens* as the two principal species breeding on home premises was also noted.

Using the year 1928 as a basis of comparison with 1935 in regard to general meteorological conditions, it was found that in comparing the fauna with 1935 the outstanding factor has been the reduction in numbers of the domestic type of mosquitoes and the practical extinction of the woodland group. The marsh mosquitoes on the other hand have not shown a corresponding decrease in numbers, indicating that control of this species under excessive breeding conditions has not been accomplished. Its long flight range habits, as well as the tremendous reproductive capacities which it has shown, indicate that the problem is one which only further study and application can solve.

Salient drainage feature of 1935 was the particular emphasis placed upon wet lot drainage flooded by spring rains, and with completion of control measures as planned for 1936, it is expected that perfect control will result within the boundaries of the district even in the event of excessive rains as were experienced during 1935.

By use of charts, the flight of the marsh mosquitoes *Aedes vexans* into the Des Plaines Valley Mosquito Abatement District over a period of eight years is shown, proving that the year 1935 far surpassed any previous year in this regard. By means of these charts it is hoped to learn the location and exact character of the large breeding areas, in order that control methods be made to make the district mosquito-proof.

GORE (Ramkrishna N.). **A Village Mosquito-Trap.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 460-461. With 4 figs.

The author describes a simple but ingenious trap with which it may be possible to reduce the number of adult mosquitoes in rooms. It consists of a large clay pot of a type common in the village, provided with a piece of cloth hanging so as to form a sleeve inside the pot, thus rendering it more attractive. It is suggested that if the contents of the room are disturbed in the morning, an increased number of mosquitoes will find their way into the trap, and that they can be killed by placing it in the sun or in other ways. On one occasion the author has killed as many as 245 mosquitoes with one of these traps, but he gives no details about the sex of the mosquitoes or of the species to which they belonged.

P. A. Buxton.

GALLIARD (H.). L'anthropophilie de *Culex fatigans* au Tonkin. [**Anthropophily of *Culex fatigans* in Tonking.**].—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 517-518.

The author points out that in some places in the tropics *Culex fatigans* bites man, in others it does not. [He might have added that in Calcutta it is common at nearly all times of year, though it only becomes a serious nuisance to man for a short period each year. See Senior WHITE, *Bull. Entom. Res.*, 1934, Vol. 25, p. 551.] The author

holds that some of the differences in this respect are due rather to the imperfection of experiments than to any real difference in the avidity of the mosquito for human blood.

P. A. B.

FINK (David E.) & HALLER (H. L.). **Relative Toxicity of Some Optically Active and Inactive Rotenone Derivatives to Culexine Mosquito Larvae.**—*Jl. Econom. Entom.* 1936. June. Vol. 29. No. 3. pp. 594–598. With 1 fig.

The authors study the toxicity of certain compounds derived from the plant *Derris*: their insecticidal value is determined upon batches of larvae of *Culex*.

It is generally known that powdered *Derris* root contains insecticidal substances which are of great potential value though not very regular in their effect. It is generally held that rotenone is the most strongly insecticidal among the substances which have been isolated and studied. Several new compounds closely similar to rotenone in molecular structure have been isolated. The present paper describes the result of testing them, in very fine suspension in water, against *Culex* larvae. It is clear that, over a wide range of concentrations, optically active dihydrodeguelin and rotenone are much more insecticidal than four other compounds which were tested.

It is not likely that rotenone insecticides will be of much value against mosquito larvae, because of the cost of dealing with large volumes of water. But the work is of great interest because it points to ways in which insecticides derived from *Derris* might be made more sure and efficacious in their effect on fleas and many other insects.

P. A. B.

GIBBINS (E. G.). **Uganda Simuliidae.**—Reprinted from *Trans. Roy. Entom. Soc. London.* 1936. June 19. Vol. 85. Pt. 9. pp. 217–242. With 24 figs.

In this paper the author adds to the information which he has already published on the systematics and biology of species of *Simulium* occurring in Uganda.

The part of the paper of most interest to readers of this *Bulletin* is that which deals with *Simulium damnosum*. The author refers to the medical importance of this insect as a host of *Onchocerca volvulus*, which is now known to be associated in the Congo and the Sudan with blindness. It appears that in Uganda the adults of this insect are capable of flying great distances and in sufficient numbers to cause annoyance. They have twice raided Kampala, though local investigations appear to have shown that there are no breeding places nearer than the Nile, 45 miles away.

The great part of the paper is systematic and deals with nine species of which five are described as new. The author gives descriptions in nearly every case of the male, female, early stages and breeding place. The paper is fully illustrated.

P. A. B.

TONNOIR (A. L.). Notes synonymiques sur quelques *Psychodidae* (Diptera). [**Note on Psychodidae.**]—Reprinted from *Bull. et Ann. Soc. Entom. de Belgique.* 1934. Vol. 74. pp. 69–82. [26 refs.]

Only a small part of this paper is of interest to the readers of this *Bulletin*. In 1915 Taylor described a Psychodid from Queensland as

Pericoma townsvillensis, and stated that it "is a very severe biter, the irritation remaining for some hours." This has stood as the only record of a Psychodid (other than *Phlebotomus*) sucking blood.

The author of the present paper, in the course of a general revision of the family, has examined some of the original material. In his view it is referable to the genus *Telmatoscopus*; dissection clearly shows that the insects could not have sucked blood. P. A. B.

QUARTERLY BULLETIN OF THE HEALTH ORGANISATION. LEAGUE OF NATIONS. Geneva. 1936. June. Vol. 5. No. 2. pp. 211-236. With 4 figs.—**The Fly Problem in Rural Hygiene. I. Report of the Meeting of Entomologists convened by the Health Organisation of the League of Nations on the Fly Problem in Rural Hygiene, held in London on December 16th and 17th, 1935. II. The Biothermic Method of Fly Destruction and the Ease with which it can be adapted to Rural Conditions [ROUBAUD (E.)]. III. Investigations into the Fly Density in Hungary in the Years 1934 and 1935 [LÖRINCZ (Francis) & MAKARA (George)]. IV. On Flies visiting Human Faeces in Hungary [LÖRINCZ (F.), SZAPPANOS (G.) & MAKARA (G.)].**

The series of papers, the titles of which are given above, relate to conditions in France and (more especially) Hungary, and are consequently of only indirect tropical application, if any. Nevertheless, it is to be observed that the "Report," while noting that "The fly problem in Eastern countries appears to differ in many respects from that in Europe," recommends that the matter "should form a subject for discussion at the Conference on Rural Hygiene for Eastern Countries in 1937." As regards the biothermic method for the prevention of fly-breeding in stable-manure (II), Roubaud claims that "At the Pasteur Institute of Nha Trang [French Indo-China], pits with sliding cob covers resting on the manure are used with great success." In Hungary it appears (III) that "house-flies do not breed in human faeces," and that "neither village latrines nor human faeces exposed in the open are as frequently visited by house-flies as has been previously supposed." [To what extent, if at all, racial differentiation plays a part in the local importance of *Musca domestica* as a disseminator of intestinal disease has yet to be proved.]

E. E. Austen.

FORD (Norma). **Further Observations on the Behaviour of *Wohlfahrtia vigil* (Walk.) with Notes on the Collecting and Rearing of the Flies.**—*Jl. Parasitology*. 1936. Aug. Vol. 22. No. 4. pp. 309-328. With 4 figs. & 1 map. [22 refs.]

The author has added considerably to what is known of the habits of *Wohlfahrtia vigil* and observed a number of cases of myiasis due to infestation by its maggots in Canada.

It appears that myiasis due to *Wohlfahrtia vigil* is much commoner than had been supposed: from cases in infants who were observed in June, 1934, in Toronto, Canada, it is clear that the larvae in their first stage are capable of penetrating healthy skin, and that extensive damage frequently results. They are a definite danger to infants sleeping out of doors, but it seems that they cannot penetrate the skin of an adult human being.

The adult fly does not visit carrion and is not commonly attracted to flowers, though there are circumstances under which individuals of both sexes can be taken on flowers of particular sorts.

The female appears to be more active at dusk, and capable of entering the hole of an animal and discovering its host in partial darkness. This has been actually observed in the laboratory, young mice being exposed in a box in a cage containing flies. In general the female deposits living larvae, but occasionally eggs are also produced; in this event they hatch almost at once. It appears that the larvae can go through the whole period of growth in four days in a living mouse. If it is removed partly grown from its host it is capable of feeding on meat and completing its growth. P. A. B.

CANAVAN (W. P. N.). **Occurrence of Intestinal and Nasal Myiasis in Oklahoma.**—*Jl. Parasitology*. 1936. Apr. Vol. 22. No. 2. pp. 228-229.

Reference is made to a previous publication by MELENEY and HARWOOD of a case of intestinal myiasis with the larvae of *Hermetia illucens*, the soldier fly, and three more cases of myiasis are briefly noted, all occurring in Oklahoma City. The first was a boy of 6 years, suffering from fever of 104°F., abdominal pain, vomiting and diarrhoea, whose symptoms cleared up immediately after passage of the larvae. The second was a girl of 12 years, working on a farm, who in a fit of convulsions coughed up 2 larvae and 56 pupae of *Stomoxys calcitrans*. The third was also a young girl [age not given] from whose nose were extracted 26 larvae and 13 pupae of the Texas screw-worm fly, *Cochliomyia hominivorax*. H. H. S.

MARIANI (Giacomo) & BESTA (Bruno). La blatta orientale serbatoio di protozoi ed elminti. [**The Cockroach as a Reservoir of Protozoa and Helminths.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Mar. Vol. 17. No. 3. pp. 177-184. [19 refs.]

The author examined 93 cockroaches, *Periplaneta orientalis*, captured in the hospital, the street, the Lazaretto, the laboratory of Mogadiscio, Somaliland, and found in their alimentary canals, flagellates, *Trichomonas* and *Chilomastix*, amoebae, infusoria, spirilla, and helminth ova, *Enterobius*, *Trichuris*, *Ascaris*, and *Blastocystis*. When allowed to feed on bread impregnated with faecal matter containing *E. histolytica*, *E. coli*, *E. nana*, flagellates and *Blastocystis*, the cockroaches were found to retain them alive for 1 to 20 days and this insect may, therefore, act as a transmitter of infection. H. H. S.

LATYCHEV (N.). Expérience d'application de certains dérivés de benzol dans la lutte contre les tiques *Ornithodoros papillipes*. Communication préliminaire. [**Benzol Derivatives for Eradication of Ticks.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 2. [In Russian pp. 174-178. French summary p. 178.]

Ticks, especially *Ornithodoros papillipes*, carrying pathogenic spirochaetes in Central Asia may transfer infection to their offspring and their nests may retain the infection for years; hence the importance of destroying and getting rid of ticks. Hydrocyanic acid has proved

totally inadequate, even in high concentration ; chloropicrin is better but after its use it hangs about the dwelling and is got rid of with difficulty. The author has carried out laboratory experiments with benzol preparations, notably paradichlorobenzol, and reports that the results are very promising.

H. H. S.

CHOPRA (R. N.). **Control of Drugs in India.**—*Bombay Med. Jl.* 1935. Nov. Vol. 4. No. 11. pp. 219-222. Also in *Jl. Indian Med. Assoc.* 1935. Dec. Vol. 5. No. 3. pp. 121-125.
BOMBAY MEDICAL JOURNAL. 1935. Dec. Vol. 4. No. 12. p. 242.
—**A Pure Drugs Act for India.**

The *Indian Medical Gazette* has described India as "a land of quacks, quack traders, and quack medicines." Drugs and chemicals of defective strength and impure quality pour into India and untested sera and vaccines are freely sold. Druggists are unqualified.

Some years ago a small committee, of which the author was chairman, was appointed to study the question. It reported in 1930, but owing to "financial stringency" no Government action has been taken. The subject is here discussed with reference to the drugs and chemicals of the British Pharmacopoeia, those known as approved medicines and the group of patent and proprietary medicines. It is stated that firms abroad manufacture drugs specially for the Indian market and are able to undersell the local manufacturers, who consequently lower the quality of their own products.

The Drugs Enquiry Committee collected samples at random from different Provinces, which the author analysed. Adulteration was common and many packages were under strength as well as underweight. In some instances quinine tablets contained no quinine. Biological products and organic compounds containing arsenic and antimony may be satisfactory when imported but climatic conditions and defective storage produce rapid deterioration, and many retail sellers have no proper storage arrangements. The practice actually obtains of buying up time-expired products in Europe and loosing them on India at a cheap rate. Many of the Indian products moreover are not up to standard and they are put on the market with toxicity and strength untested. Of the patent and proprietary medicines it is unnecessary to speak; the Indian public consumes them "voraciously."

The author points out such dangers as the use of anti-diphtheritic serum of uncertain strength and of faked insulin in diabetic coma as well as the risk to life of impure organo-metallic compounds.

At present mere adulteration of drugs is not prohibited in India by enactment, nor is the sale of a drug below standard punishable except on the basis of misrepresentation or fraud. What is required is central as well as provincial legislation, machinery to test medicinal preparations and inspectors to collect samples. There are, however, difficulties: e.g., the profession of pharmacy is unorganized in India; "anyone can compound and sell medicines," and the drugs used in the indigenous systems of medicine, largely employed, cannot be brought into any scheme for there are no standards. The following resolution passed by the Sind Medical Union aptly sums up the situation—

"The Sind Medical Union notes with regret and concern the Government of India's deliberate apathy to standardise and control the purity and strength of drugs and medicinal preparations, and to penalise adulteration

thereof, by an Act of legislature, the great importance and necessity for which has been fully shown by the Chopra Committee Report in 1930. The Union urges the Government to enact a law at the earliest sessions of the Assembly, as the welfare of the public is being constantly jeopardised more and more by an increasing number of spurious drugs and biological products imported from foreign countries which has also induced some local manufacturers to produce non-genuine drugs and preparations to compete with the cheaper foreign stuff or otherwise to exploit the local market.

"The Union further urges the Government to enact concomitantly a Pharmacy Act for establishing institutions with a view to license trained chemists and druggists, and to set up machineries to test medical preparations of all kinds and other incidental work."

A. G. Bagshawe.

BRODRIBB (H. S.) & CULLINAN (E. R.). **A Simple Test for Latent Jaundice.**—*Lancet*. 1936. May 30. pp. 1237-1238.

Jaundice is not visible in the skin and sclerotics under ordinary conditions unless the bilirubin has risen from the normal 0.1-0.4 mgm. per cent. to 2 mgm. (4 units van den Bergh). When histamine is injected into the skin the capillaries become abnormally permeable for bile pigment. The authors devised or applied the following qualitative clinical test to a number of cases of obstructive, hepatogenous jaundice on the one side—catarrhal jaundice, toxic jaundice, cholelithiasis; and haemolytic jaundice—acholuric jaundice, pernicious anaemia, on the other. The technique of the test is as follows: The patient is placed in a good daylight and one minim of a sterile solution containing 0.1 mgm. histamine (the authors used Burroughs, Wellcome & Co's. histamine acid phosphate, 0.3 mgm. of which contains 0.1 mgm. histamine) is injected *intradermally* into an area cleaned with spirit. The dose must not exceed 0.1 mgm. A weal forms reaching its maximum in 10-20 minutes. If positive the weal is of a yellow tint, which may be better brought into evidence by pressure with a slide.

Examination of 48 cases in the first group, 44 being positive and 4 negative, showed that the threshold is at 0.5 mgm. per cent. or one unit indirect van den Bergh, two at that level and all above being positive, 2 at that level and two below being negative. For the second group the threshold is higher, between 1.1 and 1.4 mgm. per cent. or 2.2 and 2.8 units indirect van den Bergh. Of 24 tested in this group 16 reacted positively having 1.4 mgm. or 2.8 van den Bergh units or over, 8 were negative with 1.1 mgm. or 2.2 van den Bergh units or less.

H. H. S.

GORDON (R. M.) & DAVEY (T. H.). **A Convenient Form of Case for the Transport of Laboratory Apparatus in the Tropics.**—*Ann. Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. p. 169. With 1 plate.

The device described in this brief note should prove of great service to the travelling investigator in the field, who may be able to stay in one camp but for a short time and cannot afford to waste much of it in packing and unpacking his apparatus. The authors have conceived the idea of utilizing petrol or kerosene cases, and fitting them up for general laboratory needs or for dissection of mosquitoes or other insects. This is done by providing the boxes with a hinged lid



Photograph of cases used for the transport of laboratory apparatus in Sierra Leone

[Reproduced from the *Annals of Tropical Medicine and Parasitology*]

" which when let down forms a convenient shelf. At the four bottom corners of the case are screwed metal sockets measuring $2\frac{1}{2} \times 1$ inch. These sockets are similar in design to those provided on tropical camp-beds for the reception of the poles which support the mosquito net and can be made by any local blacksmith at a cost of a few pence. The supports for the boxes consist of wooden poles measuring two feet long by an inch thick, and narrowed at one end to fit into the metal sockets just described, owing to their length they are carried tied to the top of the box. After the case has been placed on its legs greater stability is produced by separating the legs by means of notched wooden laths.

H H S

AIR MINISTRY. Medical Notes and First-Aid Treatment for Flights in the Tropics and Sub-Tropics. Promulgated for the Information and Guidance of all concerned. Air Publication 1486. 2nd Edition, January, 1936—43 pp. With 3 figs. 1936. London. H.M.S.O. [9d.]

See *Bulletin of Hygiene*, 1935, Vol. 10, pp. 108 & 543

ZIEMANN (H). *Militärarzt und Tropen-Medizin*—Reprinted from *Deut. Militärarzt*, 1936. Vol. 1. No. 2. pp. 67-74.

SPAAR (Eric C). Encephalitis Lethargica in the Tropics. A Record of Two Cases occurring in Ceylon—*Jl Trop Med & Hyg* 1936. Apr. 15. Vol. 39. No. 8. pp. 89-92. With 2 charts & 2 figs.

HOEPLI (R). Methods of illustrating Scientific Papers—*Chinese Med Jl*, 1936. Feb. Supp. No. 1. pp. 474-518. With 14 plates, [34 refs.]

REVIEWS AND NOTICES.

CALCUTTA. **Annual Report of the Calcutta School of Tropical Medicine and the Carmichael Hospital for Tropical Diseases 1935** [CHOPRA (R. N.), Director].—191 pp. With 2 figs., 6 graphs & 2 plates. 1936. Alipore : Bengal Govt. Press.

The yearly report of this important training school for those engaged or engaging in practice or research in the tropics is, as usual, a record of work covering many fields. A perusal of its 191 pages leaves one impressed with the emphasis which is laid upon research and upon building up steadily all the requirements of the student in the shape of museums and libraries. The report is really made up of a series of no less than 25 reports which are introduced and to some extent summarized in the reports of the Director of the School and that of the Superintendent of the Carmichael Hospital. In continuation of those first two reports there come those of the several professors and the various heads of definite enquiries or departments. There is, perhaps, in all of these reports an indication that routine duties are making a much greater call upon the time of those in particular who are best able to make serious contributions to our knowledge of the problems of tropical medicine. This is only a case of history repeating itself and seems to be the penalty, if that is the correct word, for increasing popularity.

According to the director, one of whose researches it is, a new cutaneous manifestation has been observed in epidemic dropsy. This is a hyperpigmentation of the skin, chiefly of exposed parts such as the face, hands and feet. A case of Darier's disease admitted to the hospital seems to have been the first case to have been admitted there, only to be discharged in due course, as there is no known satisfactory treatment for the disease. Another case of some importance, under the heading of "treatment of urinary infections by a Ketogenic diet," is given in full with the diet used. The dietetic treatment in this case seems to have cured the bacilluria, when conventional treatment devised to render the urine alternately acid and alkaline had failed. It is well to have such cases fully reported. Reports by the professors of the school and heads of enquiries refer very largely to the researches which are being carried on in their several spheres. Many of these have already been published or will be published in due course. An interesting note is submitted by the professor of bacteriology, pathology and helminthology. It has reference to "hill diarrhoea." He concludes that the intestinal disorders which tend to break out in epidemic form during the rains in hill stations are mainly of two types—dysentery and diarrhoea. These are bacterial infections and there is no evidence in support of the "mica theory" for their causation. Hill diarrhoea is regarded as a "separate clinical entity" but it is also maintained that the intestinal fluxes which occur in a station like Darjeeling are "due to a large variety of bacteria and that climatic factors are not the sole cause of these outbreaks." There is no suggestion made here of a psychic factor such as is put forward for "Simeloengen disease" (KOUWENAAR, *Genesck. Tijdschr. v. Nederl.-Indië*. 1936, Vol. 76, pp. 2451-70) but evidently some such element enters into the causation of the mystery disease "Jhin-Jhinia." It has been quite difficult to track down cases of this disease during an actual attack. The idea prevalent is that "this disease is caused by the rush of blood from the feet up to the

head. The diminished blood in the feet causes the initial tingling sensation and the excessive blood in the head gives rise to a hot burning sensation, dizziness, tremors and congestion of the eyes." Two cases were found "tied to a bamboo post and pitcherfuls of cold water were being poured on her head at about 7 o'clock in the evening." The tremors and the shivering are considered to be more the results of the treatment than any diseased condition. One more excerpt must suffice as an example of the ability of the Calcutta workers to pronounce confidently upon the results of their experience. It occurs in the report of the anaemia and respiratory diseases department and refers to blood cell measurements and it may be transcribed:—"In our experience the halometric method is of no practical value. . . . The PRICE-JONES method, giving as it does not only the mean size of the red cell but the dispersion around that mean, is a valuable and accurate method but is extremely laborious. . . . The method is not . . . considered to be a practical one for general use even for a research laboratory. . . . The general conclusion arrived at was that the packed-cell method of estimating cell volume is a simple and accurate one and absorbs practically none of the worker's time; it supplies all the information regarding the size of the red cells that is required in a routine blood examination."

W. F. Harvey.

BRUMPT (E.). [Membre de l'Académie de Médecine, Professeur à la Faculté de Médecine de Paris, etc.]. *Précis de Parasitologie*. 5th Edition. Entirely revised. Vol. I. pp. xii + 1082. With figs. 1-567 & 4 plates (2 coloured). Vol. II. pp. 1083-2140. With figs. 568-1085. 1936. Paris: Masson et Cie. [Bound 200 francs; Unbound 170 francs.]

The fifth edition of Brumpt's well known *Précis de Parasitologie* has now appeared in two volumes, each of over a thousand pages; this increase is partly due to more detailed treatment of certain parasites but chiefly to the inclusion of new matter and new illustrations. For the benefit of those who are perhaps not familiar with this now classic textbook, only a slight indication of the great extent of ground covered by it can be given. The title *Précis* applied to two substantial volumes becomes entirely intelligible when it is realized that this work deals succinctly with almost every human parasite, and many parasites of animals. The list includes the Spirochaetes, which Brumpt continues to place provisionally as one of the classes of the Protozoa; the Protozoa; the Metazoa including Plathelminthes, Nematelminthes, Annelida and Arthropoda, and finally the parasitic Fungi with the Mycoses. Students of protozoology or helminthology will now find their subjects in the first volume, while those whose special interest lies in the Arthropoda or the Fungi will discover what they require in the second volume.

In his class Spirochaeta the author has the genera *Spirochaeta*, *Treponema*, *Leptospira* and *Spirella*; in the Rhizopoda, *Entamoeba*, *Endolimax*, *Pseudolimax*=*Iodamoeba*, and *Dientamoeba*. In the Flagellata, besides the genera *Leishmania* and *Trypanosoma* already mentioned, the genera *Enteromonas*, *Embadomonas*, *Tricercomonas*, *Chilomastix*, *Trichomonas* and *Giardia* are considered. In the Sporozoa, he deals with the genera *Eimeria*, *Isospora*, *Plasmodium*, *Haemogregarina*, *Encephalitozoon*, and *Sarcocystis*. In the Infusoria he

describes *Balantidium* fully and still finds place for *Nyctotherus*, *Colpoda*, *Chilodon* and *Uronema*.

Writers who have had the temerity to compress the Spirochaetes and Protozoa into half a hundred pages may well feel some uneasiness on the perusal of Brumpt's allowance of four hundred and fifty pages for these two groups; four hundred and seventy pages serve for the Arthropoda, but no less than five hundred are allotted to the Fungi and Mycoses.

The plan of the *Précis* remains the same as that of the previous edition. Although the author states that a morphological study permits the identification of the parasites and their classification according to the rules of scientific nomenclature, we must be careful not to believe this declaration implicitly. It is well known in fact that Brumpt has a very strong leaning towards the side of those who hold that biological characters suffice for the erection of species.

We find, therefore, in the section on Spirochaetes, *Treponema pertenue* with, it is true, a tentative claim to the existence of morphological differences from *Treponema pallidum*; this claim, however, seems to be relinquished by the admission "we cannot really distinguish them except by their biological reactions." In connexion with any attempt at biological differentiation in this particular instance, the work of Hudson on "Bejel" or child syphilis among the Bedouin Arabs of Syria certainly deserves special mention. Among the Rhizopoda, *Entamoeba dispar* is given much prominence and there is justification for this if Brumpt's contentions are correct, namely that this is a parasite morphologically indistinguishable from *Entamoeba dysenteriae* (*E. histolytica*), and that it is a very common and entirely innocuous one. We are not surprised to find in his class Flagellata that *Trypanosoma gambiense*, *T. rhodesiense* and *T. brucei* are different species, the biological characters assuming more specificity in proportion as the morphological foundation for the species crumbles. The determination of the species of *Leishmania* is admitted to be very difficult, because these parasites present identical morphological characters in the host's tissues and also in culture, whichever species is being studied; even after invoking the aid of biological characters Brumpt frankly admits that the difficulty remains. This principle, of biological differentiation of species where no morphological difference is known to exist, is carried on in the sections on worms, the most striking case perhaps being Brumpt's own *Onchocerca caecutiens*, which he distinguishes from *O. volvulus* by a wealth of non-morphological data.

It is clear that the morphologists are not to have it all their own way when Professor Brumpt intervenes. And it is not merely that he expresses his own dogma on the matter; he makes out a very stout case for his biological species in quite a series of instances. Everyone who is interested in this question of what constitutes a species of parasite, especially of human parasite, will necessarily pay attention to his arguments.

The section on Fungi has been revised and to some extent re-arranged; in addition a great deal of new information and many illustrations have been introduced. The author aligns himself with those other mycologists who consider *Actinomyces israeli* to be the sole agent of actinomycosis. Treatment of ringworm by thallium acetate receives detailed consideration, and cases are submitted showing its good results as well as some of its drawbacks. In regard to Caraatés or Mal

del Pinto he reaches the conclusion that it is probably not of fungal origin and suggests that new research is required on it.

Among new species included are *Spirochaeta turicatae*, and *Schistosoma intercalatum*, and there is a description of *Microfilaria malayi*. Recent work on yellow fever mosquitoes and on races of anophelines is also recorded.

It is not remarkable that in practically rewriting a text book of this scope, some omissions to bring up-to-date and some printers' and other slips can be noted. The cercaria of *Schistosoma haematobium* is still figured with three pairs of cephalic glands. Long and painstaking research, recently concluded by Gordon and Davey's paper on this subject, yields very convincing evidence of the presence of five pairs of glands. That paragon among parasites, the parthenogenetic female of *Strongyloides* still appears in this edition. Possibly the recent work has been overlooked, or is not yet accepted by Brumpt.

Some of the printers' slips encountered may be pointed out, for revision purposes : p. ix Stocke for Stokes, p. 159 conservés for conservés, p. 159 O'Farrell for O'Farrell, p. 214 Wolley for Woolley, p. 244 Creco for Cerco-monadidés, p. 267 Lister for Lester Institute, pp. 306 and 320 Fordes for Forde, p. 326 probabie for probable, p. 967 Harwey for Harvey, p. 1447 S. B. for D. B., in plan du tome 1, Hémathelminthes for Némathelminthes, p. 1586 Sterigmatocystis for Sterigmatocystis.

The footnote is exploited more than ever in this edition, some pages are nearly half occupied by a series of these notes, which often contain essential information. This could well be incorporated in the general text, where it would be more easily grasped, without repeated and irritating distraction of attention.

The author always keeps in view the final object of the study of human pathogenic parasites, namely the prevention of disease. For most parasites there are given one or two paragraphs on prophylaxis, while in the case of important diseases like malaria, trypanosomiasis, yellow fever, echinococcus and several other infections, the prophylaxis is discussed at useful length.

That anyone in these days should undertake single-handed to deal with Parasitology on this scale betokens optimism, and that he should succeed so well as Brumpt has done is the clearest evidence of his wide knowledge and of his untiring industry.

Anyone engaged in the study of modern parasitology is sure to find Brumpt's *Précis* absolutely essential. D. B. Blacklock.

DIEUAIDE (F. R.) [Edited by]. **Manual for the Medical Services of the Peiping Union Medical College Hospital.** Fifth Edition. Revised by the Staff of the Department of Medicine.—pp. vi+204. With 4 plates & 1 chart. 1936. Peiping, China. [\$1.50 Chinese].

The present volume is the fifth edition of the manual, which was first published in 1922. This edition has been extensively revised by the Members of the Medical Staff, each man dealing with the subject in which he specializes, while the general and editorial work has been undertaken by Dr. Dieuaide.

The first section of the book is given over to a description of the various medical services of the hospital, and details the duties of the visiting, resident and assistant physicians, internes and clinical clerks ; the regulations for duty and vacation ; for the interworking of the services and the dealing with patients and hospital records. Instructions regarding the wards, laboratories and clinics, the admission of

patients both general and infectious, the arranging of consultations and operations, the prescribing of diets and drugs, the dealing with accident patients and emergencies, the discharge and transfer of patients, with deaths and post-mortems, the investigation of complaints from relatives or patients are all detailed in a very minute and comprehensive manner. The subject of medical etiquette is not forgotten and very useful hints and instructions are given under this head, which no doubt are the means of avoiding much trouble likely to occur in the working of large institutions such as this College Hospital.

The second section describes the procedures undertaken on admission of the patients and for the routine of note-taking during their stay in hospital with emphasis on the special tests to be carried out in the various diseases. Section three details very elaborately and minutely the scheme of history-taking for all types of patient. Section four describes the laboratory facilities of the Institution and the investigations undertaken by each laboratory. It details the various investigations to be done on the blood, body fluids, gastric contents, urine, etc., with summarized accounts of how these are carried out in these departments.

The fifth section relates to diagnostic procedures, details them, gives the indications for these in the different conditions and diseases, describes how they are carried out and precautions to be observed. This section is well done and should prove useful to any hospital officer or resident.

The sixth section describes various therapeutic procedures, such as the preparation of various drugs for intravenous injection and its technique, blood transfusion, of which two methods are given, serum and vaccine injections, sigmoidoscopy (in which the dorsal position is not mentioned and the help of skilled inflation is not noted), punctures of various organs and cavities and many other tests such as Schick, Dick, tuberculin, glucose tolerance, urea concentration, etc. The paragraphs on immune and antitoxic sera and the precautions necessary to "desensitize" patients, and to avoid fatalities in the susceptible are such as should be read by every practising physician and their observation would prevent fatalities. A summary of treatment in cases of poisoning and other emergencies is given. Methods of vaccination are described both against smallpox, the typhoid groups and typhus and also with autogenous vaccines.

The scheme advocated of daily increasing doses for ten days with autogenous vaccines containing streptococci may perhaps suit practice among the Chinese but would certainly not be devoid of risk in other countries and is contrary to practice here.

In the final sections a list of abbreviations for case-taking is given and figures for normal values in the chemistry of the blood, spinal and gastric fluids, and various useful formulae and figures are given. The book is provided with an index. To sum up, this is a valuable manual, containing a vast amount of information which has been compiled with considerable care. It will repay perusal by any medical man whose duties include hospital work and will prove a useful reference volume for every practitioner. The price is only 1½ dollars (Chinese).

W. E. Cooke.

BUREAU OF HYGIENE AND TROPICAL DISEASES

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CHAGAS' DISEASE.

A CRITICAL REVIEW.

By Warrington YORKE, M.D., F.R.C.P., F.R.S.

(Sectional Editor, Tropical Diseases Bulletin.)

The present position of knowledge on the mode of transmission of Chagas' disease has been discussed by HOARE (1934) in a recent volume of this *Bulletin*. Whilst the geographical distribution of infected bugs has not yet been fully investigated there seems little doubt that they are widely distributed in the American continent between the latitudes 35°S. and 30°N. They have been found all over the south-eastern portion of Brazil and Uruguay, except in the coastal zone, in Paraguay, in all the provinces in the northern portion of the Argentine, in Chili, Peru, Venezuela, Panama, Salvador, Guatemala, and as far north as the southern portions of California and Arizona, U.S.A.

In view of this wide distribution of infected vectors, it is remarkable that it is still a matter of considerable doubt how far South American trypanosomiasis is a disease of grave significance. The number of human beings hitherto found to be actually infected with the trypanosome is remarkably small. The only district from which any considerable number of cases has been recorded is that of the State of Minas Geraes in Brazil. It was here that Chagas first discovered the disease in 1909: in 1916 he published an account of the 29 acute cases of the disease which he had up to that time met with in infants and young children living in that State. All these children had parasites in the blood, and of 23 which he was able to follow no less than 11 died. VILLELA and BICALHO (1923) working in the same State record that they recovered the trypanosome from 5 of 19 supposed chronic cases of the disease by inoculation of the blood into guineapigs. Whilst it is impossible from the voluminous and diffuse literature to discover even approximately in how many individuals from Minas Geraes the parasite has actually been discovered, there seems to be no reason to doubt that there is in this State a considerable focus of the infection, but that, probably owing to the firm conviction of the Brazilian workers that endemic goitre, which is so common in that part of Brazil, is merely one of the manifestations of the trypanosomal infection, the pathogenic effects of Chagas' disease in Minas Geraes have been considerably overestimated.

The only other Brazilian State in which definite instances of human infection have been found is that of São Paulo, from which 4 cases have so far been recorded.

Outside Brazil the total number of individuals in whom trypanosomes have been discovered is remarkably small; the reviewer has been able to find records of only 113 cases. These cases were scattered over an immense area. The total number found in the Argentine is 83*, and these were distributed throughout all the provinces in the northern portion of the country, except Los Andes and Misiones. Two cases have been recorded from Peru, 4 from Venezuela, 19 from Panama, 2 from Salvador and 3 from Guatemala. So far the trypanosome has not been found in human beings in Uruguay, Equador, Paraguay, Mexico, or in southern California and Arizona, U.S.A., although infected bugs have been discovered in all these countries. Details of the distribution of the cases in whom a definite diagnosis has been made by the discovery of the trypanosome are given in the accompanying table.

Table showing the geographical distribution of individuals in whom *T. cruzi* has been found.

Country and Province	No. of cases described	Authority	Age and sex
<i>Brazil.</i> Minas Geraes	Many	Chagas (1916) Villela and Bicalho (1923) Villela (1930), Dias (1934) etc.	29 cases: children mostly under 2 years Many cases
São Paulo	4	Carini and Maciel (1914) Villela (1918) Bayma (1914)	1 case: ♀ 10 years 1 case: child 2 cases: child and adult
<i>Venezuela.</i> Guárico ...	4	Tejera (1919) Torrealba (1934)	3 cases: ♂ 9 months; ♂ 2 years†; ♀ 17 years 1 case: ♀ child
<i>Salvador</i> ...	2	Segovia (1914) (1922)	2 cases: ♀ 30 years; ♂ 45 years
<i>Peru</i> ...	2	Escomel (1919) Noguchi (1924)	1 case: ♂ 40 years 1 case: <i>T. cruzi</i> found in blood culture from supposed case of yellow fever
<i>Guatemala</i> ...	3	Reichenow (1934)	3 cases: ♀ 14 months; ♂ 14 months; ♂ 18 months
<i>Panama</i> ...	19	Miller (1931) Clark and Dunn (1932) Clark (1934). Personal communication to DeCoursey DeCoursey (1935) Johnson and de Rivas (1936)	3 cases: ♀ 18 months; ♀ 2 years; ♂ 6 months 2 cases: ♂ child; ♀ 10 years 7 cases: 6 years; 36 years; 10 years; 25 years; 50 years; 18 years; 74 years 1 case: 3½ months† 6 cases: ♂ 3 months†; ♂ 3 years†; ♀ 14 years; ♂ 1½ years; 28 years; 14 years

* In a recent paper Mazza (1936c) states that the total number of cases found by the Misión de Estudios de Pat. Reg. Argentina between 1932 and 1st August, 1936, is 109; a number of these cases have not yet been published.

Country and Province	No. of cases described	Authority	Age and sex
<i>Argentine.</i> Catamarca	12	Geoghegan (1928) Geoghegan (1929) Geoghegan (1933) Mazza and Ruchelli (1934) Mazza and Ruchelli (1936)* Mazza and Herrera (1936)*	2 cases; 9 months; child 1 case: ♂ 7 months† 2 cases; ♂ 3½ months; ♂ 8 months 2 cases: ♀ 5 years; ♀ 9 years 4 cases: ♀ 7 years; ♂ 2 years; ♂ 2½ years; ♀ 32 years 1 case: ♂ 35 years
Chaco ...	7	Romaña (1934) Mazza and Govi (1935) Mazza and Palamedi (1936) Mazza and Valle (1936) Mazza and Corsi (1936) Mazza and Corsi (1936)*	1 case: ♀ 2½ years 1 case: ♂ 4 years 1 case: ♂ 1½ years 1 case: ♀ 6 months 1 case: ♂ 3 years 2 cases: ♀ 11 years; ♂ 2 years
Córdoba ...	5	Zuccarini and Oyarzabal (1933) Villegas (1934) Mazza and Belmont Sánchez (1936)* Mazza (1936)*	1 case: ♂ 8 years 2 cases: ♀ 23 years, ♀ 3 years 1 case: ♂ 6 years 1 case: ♂ 9 years
Corrientes	2	Mazza, Benítez and Janzi (1936) Mazza and Benítez (1936)	1 case: ♀ 6 years 1 case: ♂ 18 years
Entre Ríos	2	Cáceres and Izaguirre (1935) Mazza, Idelsohn and Parcerisa (1936)	1 case: ♂ 5 years 1 case: ♀ 3 years
Formoso	1	Mazza (1936)	1 case: ♂ 4 years
Jujuy ...	12	Mühlens, Dios, Petrocchi and Zuccarini (1925) Mazza (1926) Mazza (1934) Mazza and Almaraz (1934) Mazza (1934) Mazza (1936)* Mazza (1936)* Mazza (1936)* Mazza and Chacon (1936)*	1 case: ♀ 8 years 1 case: ♀ 27 years 2 cases; ♂ 4 years; ♀ 6 months 1 case: ♀ 5 years 1 case: adult 1 case: ♀ 2 years 3 cases: ♂ 1½ years; ♀ 7 years; ♂ 8 years 1 case: ♀ 35 years 1 case: ♂ 3 years
La Rioja	1	Fitte (1935) Mazza and Catalán (1936)*	} 1 case: ♂ 1½ years
Mendoza ...	3	Mazza, Germinal and Basso (1935) Basso, G. and Basso, R. (1936)*	
			1 case: ♀ 9 months 2 cases: ♂ 9 years; ♂ 4 years

Country and Province	No. of cases described	Authority	Age and sex
<i>Argentina</i> (cont.)			
Salta ...	3	Niño (1928) Mazza and Mainoli (1936) Mazza and Cornejo (1936)*	1 case: ♀ 38 years 1 case: ♂ 4 years 1 case: ♂ 37 years
San Juan ...	2	Mazza and Nastri de Fischer (1935)	2 cases: ♀ 6 years; ♀ 11 months†
Santa Fé	20	Romaña (1934) Mazza and Romaña (1934) Romaña (1934) Mazza, Romaña and Parma (1935) Romaña (1935) Mazza, Romaña and Parma (1936) Mazza, Romaña and Zambra (1936) Mazza and Schreiber (1936)* Romaña and Klemensiewicz (1936)* Romaña (1936)* Romaña and Romero Cereijo (1936)*	1 case: ♂ 8 years 1 case: ♀ 1 year† 3 cases: ♂ 1½ years; ♂ 10 years; ♀ 4 years 1 case: ♂ 2½ years† 2 cases: ♂ 9 years; ♂ 4 years 1 case: ♂ 8 years 1 case: ♂ 7 years 3 cases: ♀ 6 years; ♀ 7 years; ♂ 2½ years 2 cases: ♂ 12 years; ♀ 2 years 4 cases: ♂ 52 days; ♀ 7 years; ♂ 4 years; ♂ 12 years† 1 case: ♀ 5 years
Santiago del Estero	10	Mazza and Guerrini (1934) Raimondi and Canal Feijoó (1934) Mazza and Olle (1936) Canal Feijoó (1936)* Mazza and Guerrini (1936)* Mazza and Argañaraz (1936)*	2 cases: ♀ 4 years; ♀ 14 years 1 case: ♂ 8 years 2 cases: ♀ 5 years; ♂ 33 years 2 cases: ♂ 19 years; ♂ 26 days 1 case: ♀ 7 years 2 cases: ♀ 3 months; ♂ 8 months
Tucumán	3	Mühlens, Dios, Petrocchi and Zuccarini (1925) Dios, Zuccarini and Oyarzabal (1925) Borzzone and Coda (1925)	1 case: ♀ 5 months 1 case: ♂ 4 years 1 case: child

* The references marked thus relate to papers which are to be found in Novena Reunión Pat. Reg. Soc. Argentina.

† The cases marked thus died.

N.B.—In a recent article Mazza (1936c) states that the total number of infected cases found by the Misión de Estudios de Patología Regional Argentina between 1932 and 1st August, 1936 is 109. Some of these cases have not yet been recorded. These 109 cases were distributed as follows:—Entre Ríos 2, Corrientes 2, Santa Fé 27, Formoso 1, Chaco 10, Santiago del Estero 14, Salta 4, Jujuy 10, Córdoba 2, Catamarca 10, La Rioja 3, San Juan 2, and Mendoza 22. The total number of deaths observed among these cases is 7, viz., 4 in Santa Fé, 1 in Santiago del Estero, 1 in San Juan and 1 in Mendoza.

Pathology.—The earliest accounts of the pathology of Chagas' disease are those of CHAGAS (1911) and of VIANNA (1911), who based their descriptions on the examination of the tissues of the Minas Geraes cases. Some years later TORRES (1917) gave a description of the lesions in the heart found in 4 of the 29 acute cases of the disease described by CHAGAS (1916). References to post-mortem findings are scattered throughout the subsequent papers of Chagas and other Brazilian writers, but whether they relate to cases already described, or even to Chagas' disease at all, it is often impossible to decide. Many years later, CROWELL (1923), who spent 4 years at the Oswaldo Cruz Institute, where he had the opportunity of examining the tissues of a number of Chagas' cases, gave a detailed account of the pathological findings in an acute case of the disease. He states in this article that in later papers he will deal with the pathology of the chronic form in some of its aspects, but, so far as the reviewer has been able to ascertain, these papers have not yet appeared. It is interesting to note that CHAGAS and VILLELA (1922), in their paper giving information of 62 chronic cases stated to be suffering from the cardiac form of the disease, record that in 5 of them CROWELL discovered characteristic lesions in the heart: this is referred to again later.

Goitre is extremely common in the part of Brazil from which the cases came, and CHAGAS and his colleagues firmly believed that *Trypanosoma cruzi* was the cause of this condition, which they designated "Parasitic thyroiditis." There has, however, recently been accumulated a considerable mass of evidence, which will be referred to later, indicating that this hypothesis is untenable, and that CHAGAS was actually dealing with two distinct diseases, *viz.*, a trypanosome infection and endemic goitre; in fact, there now seems little doubt that in many of CHAGAS's cases the trypanosomal infection was superimposed on epidemic goitre. This confusion of two distinct diseases makes it extremely difficult from a consideration of the Minas Geraes cases alone to unravel how much of the pathology and clinical signs ascribed by Chagas to the trypanosomal infection are really due to this disease.

Among the 117 cases, which have hitherto been diagnosed by discovery of the parasite in places other than Minas Geraes (4 from São Paulo and 113 from countries other than Brazil), only 7 deaths have been recorded (*vide* Table). One of the Santa Fé cases (MAZZA and ROMAÑA, 1934) was discovered at post-mortem to have died from broncho-pneumonia and pneumococcal meningitis, but showed typical cardiac lesions; the remaining 6 cases appear to have died of the disease, and autopsies were performed on 4 of them. As, fortunately, in some of these, particularly in the Panama cases (DECOURSEY, 1935, and JOHNSON and DE RIVAS, 1936), the complication of endemic goitre can be excluded, it is possible now to reach a fairly definite impression regarding the pathology of the acute stage of Chagas' disease.

Broadly speaking, it may be said that the pathological changes caused by the trypanosome consist in degeneration of the invaded cells and in a cellular infiltration and eventually in a fibrosis of the affected tissues. Whilst in acute cases parasites have been discovered in almost every organ in the body, the outstanding lesions are usually found in the heart, brain, and liver.

Heart.—The heart is usually enlarged, and there is an excess of pericardial fluid of a yellowish or yellowish-green colour, sometimes containing a few fibrous flakes. Microscopic examination of the heart

muscle shows the most pronounced changes. There is evidence of a diffuse myocarditis; between the muscle fibres there is an extensive infiltration of lymphocytes, plasmocytes, macrophages, and round cells. The muscle fibres themselves are widely separated from one another, and some of them show fragmentation and hyaline degeneration. Large nests of parasites are usually to be found either in the muscle fibres themselves or in the large mononuclear cells and lymphocytes lying between the muscle fibres.

The epicardium and endocardium may likewise show in places cellular infiltration and nests of parasites.

Skeletal muscles.—The muscles appear to be one of the seats of election for the multiplication of the parasites. The changes found in the voluntary muscles are essentially similar to those which occur in the heart. Between the muscle fibres are small foci of cellular infiltration, and parasites can be found both in the muscle fibres themselves and also in large mononuclear cells lying between the muscle fibres.

Brain.—Certain cases showed pronounced cerebral changes: the brain and meninges were congested and oedematous, and scattered throughout the substance of the brain were numerous small inflammatory foci. On section these lesions were seen to consist of collections of neuroglia cells mixed with mononuclear cells. These foci were not related to the blood vessels and occurred in all parts of the brain. Parasites may be found in the neuroglia cells and in the large mononuclear cells of these inflammatory foci, and in isolated cells outside the foci.

Liver.—Enlargement of the liver appears to be a very common phenomenon. On section the organ shows parenchymatous changes with extreme fatty degeneration. The presence of parasites in the liver is not a common occurrence, but they have been found in the Kupffer cells.

Spleen.—This organ is usually somewhat enlarged and congested, but studies on the histology of the spleen in this disease are complicated by malaria. Parasites are not commonly found in the spleen, but they have been recorded from at least one case (MAZZA, ROMAÑA and PARMA, 1935).

Lymphatic glands.—The lymphatic glands are enlarged, and histological examination shows congestion, lymphoid hyperplasia, mononuclear cell production and phagocytosis, with red cell destruction and a destruction of other elements that are phagocytosed. Trypanosomes have apparently not been found in this situation.

Other sites in which parasites have been found at post-mortem examination of acute cases are the thyroid, suprarenals, ovaries, and testicles.

Whilst the cardiac lesions mentioned above appear to be constantly found in young children who have died in the acute stage of the disease, it is of importance to inquire what happens in the majority of cases when the lesions are not sufficiently severe to result in death. Two recent papers—one by MAZZA and ROMAÑA (1934) and the other by these authors and PARMA (1935)—throw some light on the matter. MAZZA and ROMAÑA describe the conditions found in the heart of a child 12 months old, who died of bronchopneumonia 5 weeks after the commencement of an acute attack of the disease. The heart muscle fibres were normal, but the interstitial tissue showed an intense infiltration by monocytes which separated the muscle fibres one from the

other. There was also a hyperplasia of connective tissue and a commencing fibrosis. No parasites were found, but in certain places in the fibrous connective tissue a few large cells with alveolar cytoplasm and polymorphic nucleus were seen. These cells, which the authors call polycaryocytes, probably correspond to the giant cells found by TORRES (1917) in experimental animals, and are believed to be the site of parasites which had disappeared. In a later paper (1935) MAZZA and ROMAÑA record the results of further examination of sections of the heart of this case, and state that in one of these polycaryocytes they found a large nest of parasites. Very similar changes were found by MAZZA, ROMAÑA and PARMA (1935) in a child $2\frac{1}{2}$ years old, who died suddenly from convulsions a month after the commencement of an acute attack of the disease. These cases suggest that, if the heart lesions are not sufficiently severe to kill the child in the acute stage of the disease, the infiltrated areas undergo fibrotic changes.

The subject is of importance because, as will be mentioned later, CHAGAS and other writers attach great importance to the cardiac form of the disease in chronic cases. In one paper already referred to CHAGAS and VILLELA (1922) give clinical details of no less than 62 such cases in individuals between 11 and 54 years of age. Five of these patients died, and it is briefly recorded that in their hearts CROWELL found characteristic lesions, with parasites in one of the cases. Unfortunately it is not stated what these characteristic lesions were, or how they can be recognized in the absence of parasites. Possibly they represent a more advanced stage of the interstitial fibrosis referred to by MAZZA, ROMAÑA and PARMA. Ev. CHAGAS (1935c) in a recent paper states that in sections of the hearts of chronic cardiac cases there is hyperplasia of connective tissue and fibrosis with parenchymatous degeneration. He adds that the parasites tend to migrate to neighbouring regions, so that adjacent to extensive fibrotic areas one may find acute lesions characterized by an intensive inflammatory cellular exudate with degenerating muscle fibres and sometimes parasitic agglomerations. Ev. CHAGAS believes that as time goes on the infection tends to become attenuated owing to the defensive mechanism of the host, and consequently if re-infection is not constantly taking place the infection may come to an end. He considers that it is this fact which makes the trypanosomes so difficult to find in chronic cases.

Symptomatology.—Whilst many of those in whose blood the trypanosome is found exhibit no sign of disease and give no history of recent illness, beyond possibly a mild febrile disturbance associated with some facial oedema and adenitis, there seems little doubt that in infants and young children the infection is associated with an acute febrile disturbance, which, however, varies considerably in severity in different cases; as a rule, the younger the child the more severe are the symptoms.

In infants and young children the illness commences with a febrile disturbance, the temperature in severe cases rising to 104°F . A very common early sign is swelling of the eyelids and face. The oedema, which is at times accompanied by conjunctivitis, is firm, elastic and painless, and may be so marked that the eye cannot be opened. It is usually unilateral, and is probably to be ascribed to the bite of the infected bug. Experimentally (Ev. CHAGAS, 1935a), it has been shown that man and animals can be infected by placing the excreta of infected bugs upon the conjunctiva, and it is believed that the face and eyelids

or conjunctiva constitute the usual portals of entry of the virus. The bugs bite the closed eyelids or the neighbouring regions of the face, and the child inoculates the wound or the conjunctiva by rubbing in the infected excreta. EV. CHAGAS (1935*b*) states that the incubation period in his experimentally infected human beings was 10 to 12 days.

Study of the literature seems to afford abundant evidence that in severe cases the oedema may spread widely and involve the extremities and even the whole body. CHAGAS (1911 and 1916) attaches great importance to this subcutaneous swelling as a frequent early sign in acute cases of the disease. He states that the swelling begins in the face and rapidly becomes generalized; that when the flagellates disappear from the blood and the temperature becomes normal the oedema, as a rule, subsides, but that in certain severe cases a marked oedema persists for an indefinite period. CHAGAS describes the swelling as a hard oedema of elastic consistency, which does not pit on pressure. He believes that it is due to a myxoedematous infiltration of the subcutaneous tissue, and that it is to be explained by a specific action of the parasite or of its toxins on the thyroid gland. He points out that his patients were infants of a few months of age, or at most in the first years of life, and in perfect health. ROMANA (1935), MAZZA (1936*b*), DIAS (1936*b*) and other Argentine observers similarly draw attention to oedema of the face as an important early sign in the acute stage of the disease. ROMANA observed the condition in 8 of 9 Argentine cases between 1 and 10 years of age. Some of these lived in districts where endemic goitre is unknown. ROMANA remarks that the oedema may spread widely, and that the legs and arms may become involved, when the febrile disturbance subsides the swelling disappears. DECOURSEY (1935) in his account of the first fatal case of Chagas' disease observed in Panama mentions that the patient, a black baby, 3 months old, became ill with fever and swelling of the face and extremities about 5 days before death occurred. At post-mortem DECOURSEY found that "the thyroid was firm, symmetric, and of normal size and colour; it presented no microscopic lesions." ESCOMEL (1919), writing of the case of Chagas' disease which he found in Peru—a man of 40 years of age who came to consult him for gonorrhoea—states that his attention was drawn to the hard oedema of the eyelids, the limbs, and the rest of the body; it was this fact, in conjunction with the absence of signs of renal disease, which caused him to search for the trypanosomes. In all of the three patients (aged 9 months, 2 years, and 17 years, respectively) found by TEJERA (1919) in Venezuela oedema of the face and body was pronounced. Of the three mild cases (aged 14 months, 19 months, and 14 months, respectively) discovered by REICHENOW (1934) in Guatemala one exhibited slight oedema of the face.

There seems no reason to doubt, therefore, that oedema, usually involving the face and sometimes spreading widely over the body, is a very constant early sign of the disease. Whether, however, CHAGAS's explanation of the phenomenon, *viz.*, that it is due to the action of toxins on the thyroid gland, is correct, is, as will be mentioned later, a matter of considerable doubt. The transient oedemas of the early stages of African trypanosomiasis are well known, and are usually assumed to be due to a general toxic action of the parasite; it is possible that the more pronounced oedema characteristic of the early stage of Chagas' disease is a closely related phenomenon.

Associated with the oedema is an adenitis; the pre-auricular, sub-maxillary, and cervical glands are frequently involved, as also are the

inguinal and axillary glands. There is progressive anaemia, and the pulse is frequent, the tachycardia being independent of the temperature. The liver and spleen are enlarged, but the latter is probably often due in part to concomitant malaria. In severe cases various nervous symptoms, such as irritability, convulsions, twitchings, and clonic contractions, have been described. As a rule, the cardiac signs in the acute stages are ill-defined, and indicated solely by the enfeeblement of the organ and by tachycardia, without the marked alterations of rhythm which are said to be characteristic of certain chronic cases.

The acute stage of the disease is of short duration. Among the severe cases, which are met with, as a rule, in very young children, a considerable proportion of deaths have been recorded. CHAGAS (1916) gave an account of 29 acute cases found in Minas Geraes. Of these, 15 were in the first year of life, 11 in the second and 1 in the third and fourth years. No less than 11 of the patients died, 8 of whom were under 1 year of age. Seven of the 19 cases hitherto discovered in Panama were under 3 years of age, and three of them died. One of the two acute cases discovered by TEJERA in Venezuela died; this was a child 2 years of age. Twenty-six of the 83 cases diagnosed in Argentina by the discovery of the parasites were under 3 years of age, and 4 of the 5 cases recorded as having died belong to this group: one of these presumably died of bronchopneumonia and pneumococcal meningitis, but characteristic lesions due to *T. cruzi* were found in the myocardium; the other 4 (2 of whom were in the first year of life, one 2½ years old, and the other 12 years of age) may well have died of the disease.

In those cases which survive the acute stage the temperature usually returns to normal within a few weeks, and with the fall of temperature the trypanosomes disappear from the blood and the oedema and other signs subside. Sometimes, however, the febrile disturbance, with its accompanying signs, is prolonged for several months. MAZZA and BELMONT SÁNCHEZ (1936), for example, give details of the case of a boy aged 6 years in whom the febrile disturbance was prolonged from the end of July 1935 to December 1935; parasites were found in the blood on a number of occasions during the whole of this period.

CHAGAS (1916) believed, however, that spontaneous cure does not occur, and that those who escape death in the acute period all pass on into the chronic stage of the disease, the manifestations of which are due to multiplication of the parasite in the internal organs. He also held that the disease may present itself from the first as a chronic infection, without having passed through the acute phase. It has already been mentioned that in older children and adults the infection usually produces no immediate symptoms beyond possibly a mild febrile disturbance. Many of the infections were discovered only as the result of systematic examination of the blood of a large number of individuals, or accidentally during examination of the blood for malaria. MÜHLENS and his collaborators (1925) inoculated 6 general paralytics with the trypanosome, but only 3 became infected and these exhibited practically no symptoms. A number of patients suffering from malignant disease were experimentally infected by EV. CHAGAS (1934-1936), and here again the symptoms were mild.

In his earlier papers CHAGAS (1911) described in great detail various chronic forms of the disease, which he divided into 5 clinical groups, *viz.*, a pseudomyxoedematous form, a myxoedematous form, a cardiac form, a nervous form, and a chronic form with subacute manifestations. Although in later papers (1916) he somewhat modified his views, he

remained convinced that the disease was responsible for various forms of myocardial disease, of nervous disease, of infantilism, of hypothyroidism and goitre met with so commonly in Minas Geraes. CHAGAS attributes these various conditions to the ravages wrought by the trypanosome in such organs as the heart, brain, thyroid, testis, and endocrine glands. If CHAGAS's views are correct, then the disease which bears his name is unquestionably of very great pathological significance. Recent work, however, has raised considerable doubt whether many of the conditions included by CHAGAS among the chronic forms of his disease are in any way the result of infection with *Trypanosoma cruzi*.

KRAUS and ROSENBUSCH and MAGGIO (1915 and 1917) were the first to impugn the validity of CHAGAS's views regarding the chronic form of the disease, and the whole subject was again reviewed by KRAUS (1926) ten years later. These authors point out that, excluding the chronic cardiac cases, the symptomatology of the chronic forms of the disease described by Chagas—*viz.*, goitre, derangement of the intelligence which may lead to idiocy, defects of speech and aphasia, paralysis, cerebral diplegia, myxoedema and infantilism—has a marked analogy with that of endemic goitre and cretinism in Europe. They recall that CHAGAS's work was done in a hilly region of Brazil (Minas Geraes), where, according to MUNK (1923), 75 per cent. of the native inhabitants have goitre, and where a cretin, dwarf or paralytic occurs in every family; no cases of the disease are recorded from the Brazilian plains, where infected bugs are also found. As the result of their own investigations in the Argentine, KRAUS and his colleagues found infected bugs in the provinces of Salta and Jujuy, Tucumán, Santiago del Estero, La Rioja, Catamarca, Córdoba, Santa Fé, Buenos Aires and La Pampa. The facts that on the one hand in certain of these provinces (Córdoba, La Pampa and Buenos Aires) infected bugs were common, but goitre, which, according to CHAGAS, is one of the cardinal symptoms of the disease, could not be discovered, and that on the other hand in Northern Provinces, such as Salta and Jujuy, where infected bugs also occur, goitre and cretinism were endemic, led them to look for Chagas' disease in the Argentine. Most of the investigations were carried out in Salta and Jujuy, where endemic goitre and cretinism is seen in all stages of development—aphasia, paralysis, defects of intelligence, etc. In many places 60 to 70 per cent. of the natives are goitrous and nearly one-third of the inhabitants are cretinous, so that in almost every house a cretin can be found. ROSENBUSCH examined blood of newly-born children and of adults both by means of thick films and inoculation of guineapigs, but never succeeded in finding trypanosomes. ROSENBUSCH furthermore made the very interesting observations that, although generally speaking endemic goitre and cretinism are widespread in Salta, there is one valley (Valle Calchacie) in which, notwithstanding the fact that the houses are overrun with infected bugs, neither goitre nor cretinism is demonstrable. A further interesting fact which in KRAUS's opinion also tells against the view that the goitre and cretinism of the Argentine are chronic Chagas' disease, is the occurrence of goitre and cretinism in the domestic animals of the endemic areas. KRAUS was able to produce goitre in rats in Buenos Aires by giving them water brought from endemic areas. After reviewing the literature, KRAUS reached the conclusion that CHAGAS's dictum—where there are infected *Triatoma* there is *Trypanosomiasis americana* (Chagas' disease)—applies only in Lassance (Minas Geraes) and in no other Brazilian province or South American State.

KRAUS also attacks the question whether it is possible to distinguish clinically between endemic goitre and cretinism on the one hand, and the acute and chronic forms of Chagas' disease on the other. Generally speaking, the symptoms recorded by CHAGAS as characteristic of the acute stage of the disease, *e.g.*, fever, oedema, adenitis, enlargement of the liver and spleen, can be accepted as due to the trypanosomal infection; but as regards certain isolated symptoms, such as goitre and myxoedema, one is bound to inquire whether these are not merely accidentally conditioned by the *genius loci*. CHAGAS himself believed that this was not the case, because many of his infected infants were fed exclusively on the breast and did not drink water; KRAUS, however, points out that goitre and cretinism in the infant are often the result of goitre in the parents.

Very great difficulties are encountered in the clinical differentiation of the chronic form of Chagas' disease from endemic goitre and cretinism. In contrast to the acute cases trypanosomes are usually absent from the blood in chronic cases. KRAUS points out that the type and frequency of endemic goitre corresponds with the description of chronic cases given by CHAGAS. According to WAGNER-JAUREGG, in districts with endemic goitre and cretinism no hypertrophy of the thyroid is observed in 10 per cent. of cases; all stages from normal thyroids up to voluminous goitre are encountered. As regards intelligence, all types are met with from intact to cretinoid, half cretin and absolute cretin; and the cretins exhibit all phases from tottering gait to complete paralysis of the legs. In localities where cretins commonly occur cretinism is as frequent as imbecility. Apart from paralysis, which occurs in both diseases, athetosis, strabismus, aphasia, chorea and epilepsy are observed. As regards clinical myxoedema, it is believed by many that cretinism and myxoedema are identical; the skin of the cretin shows the same trophic lesions and the same structure as in myxoedema. KRAUS accordingly reaches the conclusion that the clinical differentiation of the chronic form of Chagas' disease and endemic goitre and cretinism is a matter of the greatest difficulty.

KRAUS and his co-workers hence concluded that such conditions as goitre, cretinism, idiocy, aphasia, paralyse and infantilism are not the result of infection with *T. cruzi*, but are manifestations of an entirely independent condition, *viz.*, endemic goitre and cretinism. The main facts on which KRAUS and his colleagues base their contention can be summarized as follows:—

1. That CHAGAS's work was done in a hilly region of Brazil (Minas Geraes) where 75 per cent. of the native inhabitants have goitre and where a cretin, dwarf or paralytic occurs in every family. No cases of the disease have been recorded from the Brazilian plains, where infected bugs are also found.

2. That infected bugs have been found in almost every province in the northern portion of the Argentine. Whilst in many of these provinces goitre and cretinism are common, in certain of them (Córdoba, La Pampa and Buenos Aires) goitre and cretinism do not occur. Similarly, in Salta province where infected bugs and goitre and cretinism are common there exists one valley (Valle Calchacie) where, although infected bugs overrun the houses, goitre and cretinism are unknown.

3. Notwithstanding the wide distribution in the Argentine of infected bugs and of goitre and cretinism, KRAUS and his colleagues

had been unable to discover a single human being infected with trypanosomes.

4. It is impossible to distinguish clinically between the so-called chronic forms of Chagas' disease (the cardiac variety excepted) and endemic goitre and cretinism of Europe.

This can be said to summarize the position of knowledge of this difficult problem in 1926, when KRAUS wrote his final paper. During the last ten years, however, many new observations have been made which bear on the question of the relationship of Chagas' disease with endemic goitre and cretinism. As will be seen from the Table, no less than 83 human beings have now been discovered in the Argentine to be infected with *T. cruzi*; these cases were distributed throughout all the provinces in the northern portion of the country, except Los Andes and Misiones.

These facts seem to warrant the general conclusion that in the Argentine cases of human infection will be found in all districts infested with bugs, provided they are searched for carefully. It is important, however, to observe that 5 of the 83 Argentine cases were discovered in Córdoba, where Kraus asserts that endemic goitre and cretinism do not occur, and that MAZZA and RUCHELLI (1934) discovered 2 acute cases of the disease in Tinogasta (Catamarca), where, they state, endemic goitre does not exist. MAZZA and GUERRINI (1934) found 2 cases of the acute form of Chagas' disease at Anatuya in Santiago del Estero, they add that they examined 101 children from this place without discovering any signs of goitre. Furthermore, careful study of the clinical protocols of the acute cases found in the Argentine reveals the interesting fact that many of them exhibited no enlargement of the thyroid, this is in striking contrast with the observations of CHAGAS in Minas Geraes. It appears, therefore, that the distribution of human infection with *T. cruzi* in the Argentine does not coincide exactly with that of goitre and cretinism, the former infection being found in certain places where the latter condition does not exist; and furthermore that many of the individuals in whom trypanosomes have been found exhibited no signs of thyroid enlargement or of hypothyroidism.

REICHENOW (1934), who has recently made a very careful study of the subject in Guatemala, found trypanosomes in only 3 cases, after repeated examination of the blood of about 100 children under 3 years of age living at Las Vinas. These children showed no sign of the disease, apart from possibly a little fever and slight oedema of the face and adenitis. REICHENOW stresses the fact that goitre and cretinism do not occur in Las Vinas and the surrounding districts.

The observations of MILLER (1931), of CLARK and DUNN (1932), of DECOURSEY (1935), and of JOHNSON and DE RIVAS (1936) in Panama are of special interest. Since the discovery of Chagas' disease in Panama in December 1930, 19 cases have been reported. Seven of the cases were in children under 3 years of age and three of them died. Of the non-fatal cases all but two were discovered as an incidental finding during malaria surveys of the Chagres River basin; the symptoms and physical signs of Chagas' disease were practically absent, and such signs and symptoms as were discovered were mild and indefinite.

CLARK and DUNN emphasize the fact that 27 years of clinical and pathological records of the Panama Canal have shown no entry of a case of Chagas' disease, and that CLARK's experience in field surveys

for malaria in five mainland and three island countries of the Caribbean sea during a period of 3 years did not reveal a case, although over 65,000 men, women and children were examined. It seems, therefore, safe to assume that the group of conditions considered by CHAGAS to be characteristic of the chronic form of his disease must be extremely rare in Panama.

It is to be noted that of none of the Panama cases is it recorded that the thyroid was enlarged, or that there was any evidence of hypothyroidism. The post-mortem records of DECOURSEY's fatal case state that "the thyroid was firm, symmetric, and of normal size and color; it presented no microscopic lesion."

JOHNSON and DE RIVAS record that they inoculated a dog with the blood of one of their fatal cases. Trypanosomes appeared in the peripheral blood on the following day and were never absent from that time until the death of the animal 36 days later. The autopsy showed that the animal died from heart failure subsequent upon parasitic myocarditis; there was no enlargement of the thyroid. This observation is in harmony with what has recently been pointed out by ROMANA (1935), viz., that, notwithstanding all the experimental research which has been carried out on this form of trypanosomiasis, no investigators have recorded any predilection on the part of the parasite for the thyroid gland, nor have they noticed hypertrophy of the gland as a result of their experiments.

The most recent work, therefore, must be held to have supported the contention of KRAUS (1926) that *Trypanosoma cruzi* was not responsible for many of the conditions, e.g., goitre, cretinism, idiocy, aphasia, paralysis and infantilism, believed by CHAGAS to be chronic manifestations of the disease, and that the true interpretation of CHAGAS's observations is that his work was done in a region (Minas Geraes) where endemic goitre and cretinism are prevalent, and that in many of his cases the trypanosomal infection was superimposed on this disease.

Chronic cardiac form of Chagas' disease.—There still remains to be considered the question whether infection with *Trypanosoma cruzi* results in a chronic myocarditis. This problem is obviously one of the greatest importance, because of the large number of cases of chronic heart disease which have been recorded from various parts of South America. CHAGAS and VILLELA (1922) gave an account of no less than 62 cases which they designate as cardiac forms of American trypanosomiasis. The patients, who were between 11 and 54 years of age, exhibited such signs as tachycardia, bradycardia, alterations of conductivity, extra-systoles, auricular fibrillation, complete arrhythmia and alternating pulse. Each of the 62 cases is described in detail, and the paper is illustrated by numerous electrocardiograms.

GAMINARA (1923) writes that the cardiac form of Chagas' disease has been recorded in Uruguay, where infected bugs have been found, but no human being has as yet actually been proved to be infected with the trypanosome.

Scattered references to large numbers of people dying from syncope are found through the Argentine literature. ROMANA (1934b) described two cases, aged 40 and 51 years respectively, which he considered to be typical chronic cardiac cases of Chagas' disease in the northern portion of Santa Fé; trypanosomes were not found in the blood of these patients, but they gave a positive Machado reaction. In a footnote it is recorded that the first patient died suddenly (probably from syncope)

six months later. ROMAÑA draws particular attention to the large proportion of deaths from syncope in this district ; in Florencia, of 40 deaths 5 were from syncope, and in Guillermina 20 of 228 deaths were from syncope. In another paper ROMAÑA (1934a) described 2 acute cases of the disease from a place near the boundary of Santa Fé and Chaco. One of these children, who was kept under observation for 15 months, developed tachycardia and other signs of heart trouble ; and ROMAÑA inquires whether " there is any relationship between this infection and the scarcity of old people which is so noticeable amongst our workers." Similarly MAZZA and GUERRINI (1934) state that in Añatuya (Santiago del Estero), where they found two acute cases of Chagas' disease, no less than 22 of a total of 233 deaths were due to syncope. JOHNSON and DE RIVAS (1936), in describing the post-mortem findings in one of their fatal cases of Chagas' disease, write : " On the basis of the gross findings at autopsy, the cause of death was given as secondary anaemia, due to intestinal parasitism with a resulting myocardial degeneration, and eventual heart failure. This is a rather common finding in small children in this locality." It was only when microscopic examination was made that the true cause of death was discovered to be an advanced degree of myocardial degeneration due to *T. cruzi*.

There is thus fairly clear evidence that myocardial degeneration and subsequent heart failure is a very common cause of death in many places in South America where infected bugs and cases of human infection with *T. cruzi* are known to occur. The evidence that the myocardial degeneration is to be associated with previous or actual infection with *T. cruzi* is, however, by no means so satisfactory. It has already been pointed out that the so-called chronic cardiac form of Chagas' disease has no counterpart in endemic goitre and cretinism of Europe. Furthermore, it is well known that both in acute cases in children and also in experimentally infected animals the parasite displays a pronounced predilection for heart muscle ; and there seems no reason to doubt that the chief cause of death in both these cases (children and animals) is parasitic myocarditis. We have to ask ourselves what happens in the majority of cases of Chagas' disease in which the heart lesions are not sufficiently severe to result in death during the acute stage of the disease. Unfortunately, very little is known. Attention has already been drawn to the observations of MAZZA and ROMAÑA (1934) and of these authors and PARMA (1935) on the changes found in the heart in two children who had died respectively from bronchopneumonia and from convulsions about a month after the commencement of the acute stage of the disease. In each case the interstitial tissue showed an intense infiltration by monocytes separating the muscle fibres from one another, and there was also evidence of a hyperplasia of connective tissue and a commencing fibrosis. These cases suggest that if the heart lesions are not sufficiently severe to kill the child in the acute stage of the disease the interstitial infiltration eventually undergoes fibrotic changes. It is, of course, quite conceivable that even though the infection itself dies out the fibrotic changes may seriously damage the heart, and, if certain parts of the heart are involved (*e.g.* Bundle of His), may give rise to the various manifestations described by CHAGAS, and finally to sudden death from syncope. As can well be imagined, it is exceedingly difficult to produce convincing evidence on this matter. We are informed by CHAGAS and VILLELA (1922) that of the 62 cases of the so-called chronic cardiac form of the

disease studied by them 5 died, and at post-mortem CROWELL discovered characteristic lesions with, in one case, numerous parasites. But it is not stated what these characteristic lesions were. TORRES (1928) gives details of the pathological lesions found at the autopsy of two persons aged 25 and 35 respectively, who died in Brazil in a region where trypanosomiasis is endemic, from what was considered to be the cardiac form of the disease. Both cases presented a parietal endocarditis, but in each the primary and essential lesion was a marked diffuse chronic myocarditis with the histological characters usually observed in Chagas' disease.

Whether these cardiac lesions are really characteristic of chronic Chagas' disease and can be distinguished from other forms of myocarditis, such as that due to syphilis, is open to doubt. The report of the Commission appointed by the National Academy of Medicine of Brazil (1924) records that in one case of the cardiac form of the disease, in whose blood the trypanosome had been found during life, the condition of myocarditis found at the autopsy was indistinguishable from a syphilitic process, although the Commission acknowledged that in Chagas' disease the Wassermann reaction is negative and antisyphilitic treatment unavailing.

A good deal of information regarding the Wassermann reaction in cases diagnosed clinically as chronic Chagas' disease is given by VILLELA and BICALHO (1923). Of the 33 cases examined only 9 gave a positive Wassermann reaction; these included 17 chronic cardiac cases, five of which gave a positive Wassermann reaction.

It is interesting to note that VILLELA and BICALHO performed the Machado test on the same 33 cases. This test is a complement fixation test in which the heart and spleen of a highly infected puppy is used as antigen (*vide* later); all the cases except two gave a positive reaction. If the test has the significance which is attached to it by VILLELA and BICALHO, the results imply that 31 of these cases—cardiac, nervous, and hypothyroidic alike—were or had been infected with *T. cruzi*. It should be mentioned that VILLELA and BICALHO actually succeeded in demonstrating the presence of trypanosomes in 5 of 19 of these cases by inoculation of 10 cc. or more of their blood into guineapigs; 2 of the positive cases were classed as chronic cardiac forms of the disease and 3 belonged to the goitrous and nervous forms. DIAS (1934a) records that the blood of 6 cases in the Oswaldo Cruz hospital, diagnosed clinically as chronic cardiac forms of Chagas' disease, gave a positive Machado reaction; the blood of these patients was inoculated into guineapigs with 3 positive results.

The present position of the important problem of the relationship of the trypanosomal infection to the chronic myocardial disease can then be summarized briefly as follows:—

1. Cases of chronic heart disease characterized by tachycardia or bradycardia, alteration of conductivity, extra-systoles, auricular fibrillation, arrhythmia and syncope, are exceedingly common in many parts of South America, where infected bugs and cases of human infection with *T. cruzi* are known to occur; and in certain districts syncope is responsible for a large percentage of the total deaths.

2. The parasite is known to have a predilection for the heart muscle, and the commonest cause of death in the acute cases is parasitic myocarditis.

3. The pathological changes observed in the hearts of patients who have died from the so-called chronic cardiac form of the disease are said by CHAGAS, CROWELL, TORRES and others to be characteristic. They apparently consist of an interstitial infiltration and fibrosis of the myocardium; occasionally parasites have actually been found in these lesions in chronic cardiac cases.

4. In a number of such cases trypanosomes have been found in the peripheral blood, and a large proportion apparently give a positive Machado reaction. This, however, does not necessarily mean that the trypanosome infection is the cause of the heart condition, any more than the finding of trypanosomes in cases of goitre and cretinism implies that they cause this condition.

5. But if these cardiac lesions, so common in endemic regions, are not the result of the trypanosomal infection, it is not easy to assign a cause for them. They are apparently not found in endemic goitre and cretinism of Europe. Attention might be drawn to the syndrome described by ZONDEK as "myxoedema heart," the main features of which are general enlargement of the heart, an indolent heart action with slow pulse, and low or absent P and T waves in the electrocardiogram; these cases are curable by thyroid and unaffected by digitalis. It is possible that some of the cardiac cases ascribed to Chagas' disease may have been confounded with this condition, but the frequency and severity of the cardiac lesions in regions where Chagas' disease is endemic, and its occurrence in some places where endemic goitre is absent, suggest that the so-called chronic cardiac form of Chagas' disease can hardly be identical with myxoedema heart. Possibly the condition may in part be due to syphilis, or the result of a secondary anaemia due to intestinal parasitism. Against the former hypothesis are the facts that the Wassermann reaction is usually negative and antisyphilitic treatment is said to be useless; against the latter is the apparent absence of a similar state of affairs in other parts of the world, where intestinal parasitism is equally common.

There seems, on the whole, to be a *prima facie* case that American trypanosomiasis may actually be responsible for a good deal of the heart disease which is apparently so common in certain endemic areas in Brazil, Uruguay and the Argentine, and the cause of so many early deaths. The chronic cardiac form of the disease may be a sequel to an acute infection in infancy or the consequence of repeated infection in later life. If this should eventually prove to be the case, then American trypanosomiasis will indeed assume a pathological significance of the first magnitude. The subject is obviously one which urgently requires much further work. To reach a final conclusion will be a matter of no small difficulty, and probably the most fruitful line of investigation will prove to be the careful observation of cases of the acute infections in childhood, with adequate post-mortem examination of the fatal cases, and prolonged observation extending over many years of those which survive the acute attack, with the object of ascertaining whether they subsequently develop the characteristic cardiac manifestations. Such subsequent observation will necessarily involve repeated examination for the trypanosomal infection, the response to the Machado reaction (should this prove to be of real value as a test for the infection), and the elimination of syphilis and other infections and infestations which might conceivably give rise to chronic myocardial changes.

DIAGNOSIS.

The diagnosis of American trypanosomiasis depends, of course, upon the discovery of the trypanosome, or upon obtaining satisfactory proof of its presence. Whilst this presents no great difficulty in the early acute stage of the disease, when the trypanosomes are to be found in the peripheral blood, the problem is very different in the later stages, when the trypanosome is confined to the heart muscle and other tissues, and only rarely appears in the blood, and then only in scanty numbers.

In the early acute stage of the disease, when the trypanosomes are usually present in fair numbers in the peripheral blood, the simple examination of fresh coverslip preparations of the blood, or of stained films, generally suffices to disclose their presence. When the parasites are too scanty to be detected in this way, inoculation of the blood into susceptible animals has been found to be of great value. The procedure most generally recommended is the inoculation of relatively large volumes (5 cc. to 10 cc.) of blood into guineapigs or puppies. By this method numerous observers—BAYMA (1914), CARINI and MACIEL (1914), TEJERA (1919), NIÑO (1928), VILLELA and BICALHO (1923), TORRES (1930), DIAS (1934a), MAZZA (1934), ROMAÑA (1936) and others—have succeeded in demonstrating the presence of trypanosomes in the blood when they were too scanty to be recognized by direct examination.

Another method of demonstrating the presence of trypanosomes in the peripheral blood when they are too few to be detected by the usual methods is that to which BRUMPT (1914) gave the name "Xenodiagnosis." This consists in allowing the clean arthropod transmitter to feed upon the suspected carrier, and in ascertaining whether the bugs become infected. Care must be exercised in the application of this test, as it has been established that bugs can infect one another by coprophagy. The method has been used with success by TORRES (1915), TORREALBA (1934), DIAS (1934b, 1935 and 1936a), ROMAÑA (1936) and others. DIAS records that he examined the blood (fresh and stained preparations) of 113 inhabitants of Lassance, Minas Geraes, with uniformly negative results. From 16 of these, blood cultures were made, and here again the results were negative. The xenodiagnosis test in 38 of the cases gave two positive results. Summarizing his work on this subject in his most recent paper, DIAS (1936a) states that in all he has applied the test in 43 cases with 3 positive results; in his opinion it is a diagnostic method of great value.

In view of the ubiquity of infected bugs in many parts of South and Central America, it is a striking fact that trypanosomes have actually been found in so few human beings (excluding Minas Geraes, in only 117 cases). This is the more surprising as the parasite has evidently been carefully sought in many places where the disease is known to be endemic. MAZZA (1926) found *T. cruzi* in the blood of one of 507 inhabitants of Jujuy, whom he examined for malaria; GEOGHEGAN (1928) examined the blood of 1,600 people in Catamarca and found trypanosomes in two cases; REICHENOW (1934) examined the blood of 103 children on three occasions in Las Viñas, Guatemala, and found 3 of them to be infected; and, notwithstanding the many thousands of blood films which have been examined in Panama, the trypanosome has so far been found in only 19 cases.

There are, however, certain considerations which make one hesitate to conclude that the infection is so rare as these records might suggest.

Attention has already been drawn to the fact that except in very young children the initial stage of the disease is usually so mild as rarely to require the attention of a physician. Such cases have accordingly been discovered only accidentally during systematic examination of the population for malaria, or because they exhibited some such sign as facial oedema, which caused the physician to consider the possibility of Chagas' disease, or, finally, because the infection happened to be superimposed on endemic goitre, which CHAGAS taught was one of the early signs of the disease. Again, it must be remembered that the period when the parasites are at all numerous in the peripheral blood is very limited—probably on the average not more than a couple of weeks or so. Whilst there is a considerable mass of evidence showing that with the subsidence of the initial febrile disturbance the trypanosomes either entirely disappear from the blood, or at least become so reduced in number that they can be found only occasionally, there is very little information regarding the length of time the infection actually survives in the human host. ZUCCARINI and OYARZABAL (1933) give details of a case which exhibited no signs of disease, except a micropolyadenitis, and in the blood of which trypanosomes persisted from May until September. ROMAÑA (1934*a*), in a region near the boundary of Santa Fé and Chaco, saw a child which was stated to have been bitten on the eyelid by a bug 8 days previously; there was oedema of the face, adenitis, and enlargement of the liver and spleen; the temperature was normal and the thyroid gland was not enlarged. ROMAÑA kept this child under careful observation for a period of 15 months. At the end of this period there was tachycardia, and the blood was infective for laboratory animals. MAZZA and BELMONT SÁNCHEZ (1936) give information regarding a boy aged 6 years who contracted the disease in July 1935, and was kept under observation until December 1935; during this period the blood was examined on 7 occasions and parasites were discovered on 5 of these, the last positive finding being on the 3rd December. A number of similar observations prolonged over periods up to 6 months are scattered throughout the Argentine literature.

REICHENOW (1934) supplies information bearing on the subject in respect of each of the 3 cases found by him in Guatemala. In the first case, a child aged 14 months with mild symptoms, trypanosomes were discovered in the blood on the 11th July, 1932; they were present for 18 days, and then disappeared and remained absent until 3rd December, when the observation ceased. In the second case, a child aged 17 months with very mild symptoms, trypanosomes were discovered in the blood on the 30th July, 1932 (a previous examination on the 16th June had been negative); trypanosomes were seen in the blood until August 6th, and were not found again until December 3rd, when, presumably, the observation ceased. In the third case, a child aged 14 months with very mild symptoms, trypanosomes were first discovered on the 7th November, 1932 (previous examination on the 7th and the 8th June and on the 28th July were negative); the blood remained positive until November 18th, after which it was negative until the observation ceased on December 3rd. REICHENOW describes how in each case the trypanosomes in the blood gradually became fewer and fewer until they finally could no longer be found either by direct examination or by subinoculation into guineapigs.

SEGOVIA (1922) records of the first case found by him in Salvador (1914) that it was well nine years after the infection was discovered;

he does not, however, furnish any information whether the patient was still infected. DIAS (1934b) records that he found trypanosomes in the blood of a goitrous idiot who had been twelve years in the Oswaldo Cruz hospital at Rio, where there was no possibility of contracting the infection; he concludes, therefore, that the infection must in this case have persisted for at least twelve years.

On the whole it can be said that study of the literature indicates clearly that the patients have not been carefully observed for any length of time. Many of them have been watched for a month or two, and then, when trypanosomes had disappeared from the blood and the symptoms had subsided, they were lost sight of. Little attempt has been made to ascertain whether acute cases passed gradually into one of the chronic forms described by Chagas; and we have no knowledge whether the disappearance of parasites from the blood is merely a temporary phenomenon or whether it is permanent, and whether their disappearance signifies that the patient is actually cured or merely that the parasite is localized in the heart or some other internal organ.

Parasites have, as has already been mentioned, been found in small numbers in the blood of a considerable number of chronic cases, but we have no means of deciding whether these patients have harboured the parasites in the heart or elsewhere for prolonged periods, or whether they were merely instances of recent re-infections. We know nothing about immunity in this infection, and it is possible that the chronic myocarditis, which is common in many endemic areas, may be the result of a summation of re-infections.

Machado reaction.—VILLELA and BICALHO (1923) attach very great importance to the value of the Machado reaction (GUERREIRO and MACHADO, 1913) as a diagnostic test in the chronic forms of Chagas' disease. They state that a glycerine and water extract of the heart and spleen of infected animals (puppies) is strictly specific; the value of the antigen is directly proportional to the degree of parasitic infestation of the organs from which it was made. Extracts of the same organs from normal animals do not contain a complement-fixing antigen. There is no correlation between the Wassermann reaction and the Machado reaction, and the results are found to be entirely independent. VILLELA and BICALHO discuss the tests performed with the sera of 67 acute and so-called chronic forms of Chagas' disease, and were greatly impressed with the small number of negative results. These 67 cases comprise 19 tested by DA CUNHA and VILLELA, of which 14 gave positive results, 2 (acute cases) inconstant results, and 3 (1 nervous, 2 goitrous cases) negative results; 15 tested by LEÃO, with 13 positive results and 2 (goitrous cases) negative results; and 33 tested by VILLELA and BICALHO, 30 of whom gave positive results and 3 (2 cardiac and 1 goitrous) gave negative results. As is clearly shown there was no relationship between the Wassermann reaction and that of Machado; in only 8 of the 33 cases examined by VILLELA and BICALHO was the Wassermann reaction positive. It is to be noted that trypanosomes were found in the blood of 5 of the 30 cases which gave a positive Machado reaction. Uniformly negative results were obtained when the Machado test was applied to normal persons or to persons suffering from other diseases.

LACORTE (1927) applied the test to 200 suspected cases of Chagas' disease in the hospital of Lassance (Minas Geraes); in 159 (79.5 per cent.) the reaction was positive. Of the 39 cardiac cases 87.2 per cent. were positive; of 119 thyroid cases 79.5 per cent. were positive;

of 6 nervous cases 100 per cent. were positive ; of 8 glandular cases 75 per cent. were positive ; and of 8 undetermined cases 25 per cent. were positive. In each of the 200 cases the Wassermann reaction was also performed, but in only 17 per cent. was it positive ; 13 per cent. gave both a positive Machado and a positive Wassermann reaction. Most of the patients with a positive Wassermann exhibited obvious syphilitic lesions. The test was also performed on 16 normal people and on 5 patients suffering from other diseases, with uniformly negative results.

VILLELA (1930) performed the Machado test with the serum of 186 patients coming from various places in Minas Geraes, and obtained positive results in 53 (29 per cent.). In 83 of these 186 cases the Wassermann reaction was also performed, with 17 positive results. As the following figures show there was no parallelism between the two reactions : Wassermann+Machado+in 2 cases, Wassermann+Machado—in 15 cases, Wassermann—Machado+in 23 cases. The 186 cases were all goitrous and were selected on this account. The positive cases were re-examined more carefully, and the great majority were found to exhibit cardiac disturbances, which could be recognized clinically or by electrocardiograms. VILLELA remarks that 90 per cent. of the chronic cardiac forms of Chagas' disease give a positive Machado reaction.

Other references to the value of the Machado test as an aid to the diagnosis of chronic Chagas' disease, and especially to the chronic cardiac forms, are scattered throughout the literature.

DIAS (1934a) inoculated guineapigs with the blood of 6 cases of the chronic cardiac type, giving a positive Machado reaction, with 3 positive results.

MAZZA (1934) in Jujuy State of the Argentine found that 1 of 20 goitrous idiots gave a positive Machado reaction, and that inoculation of the blood into a guineapig produced infection. A second goitrous idiot was found to give a positive Machado reaction in the same district, but animal inoculations were negative. MAZZA and CORNEJO (1934) examined a number of cretins and idiots in Salta province and found 3 who gave a positive Machado reaction ; attempts to demonstrate infection by animal inoculations of the blood and by biopsies of the deltoid muscles failed.

EV. CHAGAS (1934a, b, c) gives very interesting information regarding the Machado reaction in a case of malignant disease which he infected experimentally with *T. cruzi*. Before infection the Machado reaction was negative, but as early as 10 days after inoculation the patient's serum gave a positive reaction ; the reaction was more intense on the 17th day and strongly positive on the 26th day. This patient lived for 6 months after the experimental infection, and during the whole of the time the Machado reaction remained strongly positive. EV. CHAGAS, in commenting on this fact, remarks that it is known that individuals who have been removed from an endemic area, and who have not been exposed to re-infection, may continue to give a positive Machado reaction for at least 15 years. The case referred to above by DIAS (1934b) presumably falls into this category. The patient, a goitrous idiot of 32 years of age, coming from Lassance, Minas Geraes, was admitted to the Oswaldo Cruz hospital in 1922. In 1934, after she had been 12 years in hospital where she was not exposed to re-infection, the serum gave a positive Machado reaction, and the presence of *T. cruzi* in the blood was proved by inoculation into a guineapig and by the method of xenodiagnosis.

In a recent paper KESLER (1936) has described a modification of the complement fixation test. He points out that in all previous work the antigens employed had been prepared from organs of laboratory animals artificially infected with *T. cruzi*; and that the extent of infection of these organs and the potency of the antigens made from them differed markedly. In order to resolve this difficulty, KESLER devised a method of preparing antigen from artificial cultures of *T. cruzi*. He states that with the aid of this antigen he has tested over 400 serum specimens, including a number of known cases of Chagas' disease, in man and lower animals. The test proved positive in all known cases of the disease from which sera were available, and negative where there was no evidence of Chagas' disease. Tests of numerous Wassermann-positive sera indicated that no difficulty will be experienced from cross reactions in connexion with the two diseases.

Whilst the evidence is probably as yet insufficient to warrant a definite opinion regarding the significance of the Machado reaction, sufficient work seems to have been done to indicate that it cannot be brushed aside as unworthy of serious investigation. It is clear that a positive reaction is given by large numbers of people in the endemic areas, and that quite a number of the positive cases have been proved to be infected with *T. cruzi*. It also seems evident that there is no parallelism between the Machado reaction and the Wassermann reaction.

The diagnosis of Chagas' disease in the absence of trypanosomes in the peripheral blood is a matter of great importance, and the more so since trypanosomes occur in the blood for so short a period and in such scanty numbers. It is conceivable that the Machado reaction may prove specific, and in this case it will assume that same importance in Chagas' disease that the Wassermann reaction has in syphilis. In how many cases of the latter disease does the diagnosis depend upon the discovery of the parasite? If we exclude the primary cases, we have to admit that almost invariably we rely upon the Wassermann reaction; and Chagas' disease resembles syphilis in that it is extremely difficult to find the parasite, except in the early stage of the infection.

The matter is obviously one which urgently demands thorough investigation. It must be ascertained whether the Machado reaction is given by persons living in non-endemic regions, or whether it is only given by persons living in endemic districts. A simple observation of this sort would undoubtedly help to clear up the problem. If it should prove to be the case that positive reactions are only obtained in endemic areas, the case for associating it with Chagas' disease would be greatly strengthened. We should then have to proceed to the investigation of what would probably prove to be the much more difficult problem of ascertaining whether a positive reaction implied actual infection or merely that the patient had once been infected with the disease.

There is a considerable mass of data which indicates that possibly American trypanosomiasis is responsible for an enormous amount of human disease in the huge endemic areas of South America, and any test, such as the Machado reaction, which may throw light on the matter, is well worthy of the most careful investigation.

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LEPROSY.

LEPROSY REVIEW. 1936. Oct. Vol. 7. No. 4. pp. 151-200. With 32 figs. & 3 maps (1 double) on 7 plates. Quarterly Publication of the British Empire Leprosy Relief Association, 131 Baker Street, London, W.1. [2s.]

In this issue Dr. E. Muir records the impressions he formed during an extensive tour in West Africa, visiting the centres of leprosy work. The first article is a report on leprosy work in Nigeria with suggestions for improving it by adopting a policy which in time will enable the disease gradually to be brought under control, and eventually, eliminated. A table of the present leper institutions shows fourteen government Leper Settlements or Colonies with 2,229 inmates, and seven medical mission institutions for 2,793 patients, together 5,022 out of an estimated total of 200,000 lepers in Nigeria, or 1 to every 35 to 40 cases. Several of the smaller institutions are only homes for incurable cases of a charitable nature. There are, however, five large settlements under whole-time officers with an atmosphere of activity and hopefulness, the largest being at Itu with 1,500 cases, but the expense of increasing these to control effectively the spread of the infection would be prohibitive.

Muir therefore suggests the organization of the work on a provincial basis under Leprosy Boards, to meet annually at the provincial settlement and be responsible for the initiation, development and co-ordination of all anti-leprosy efforts in the province. With the provincial settlement as the centre for examining, treating patients, training anti-leprosy workers, clan settlements of an inexpensive nature would be organized to provide for the majority of the lepers of each clan after surveys. Provision should be made as far as possible in each of these for separation of infants from infectious parents. The main settlements can be most efficiently and economically administered under mission doctors, and the Native administrations in each province should be jointly responsible for the upkeep of their provincial settlement. Lay workers and nursing sisters should be able to supplement the work of the medical staff. Each settlement should have four or five hundred acres of land within easy reach of a good road and will provide work for the lepers. Good buildings should be provided for the staff, and cheap huts can be erected at little cost by the patients for their own accommodation. Infant welfare will be an important feature. A leprosy expert should be provided for Nigeria to spend some time in each of the provincial settlements in turn.

A Forest Plantation already possesses 4,640 *Hydnocarpus wightiana* trees for the supply of the pure oil for injections at much less cost than the esters, and further seedlings are available for planting out. A further article gives details of local interest of the Nigerian Leper institutions.

Leprosy in the Gold Coast is the subject of another article on similar lines, and the needs of the smaller colony of Sierra Leone are also dealt with.

L. Rogers.

BROWN (James A. K.). **Leprosy in Southern Nigeria. Problems of Treatment and Control.**—*West African Med. Jl.* 1936. Oct. Vol. 9. No. 1. pp. 10-14.

This article deals with the leper settlement at Uzuakoli with 1,082 inmates in 1935—an increase due to the admission of patients prepared

to maintain themselves, in addition to those sent by the Native Administrations, but many still have to be refused admission for want of accommodation. Thirty were discharged during the year, and children born in the colony are from their birth brought up in a special ward. About 20 per cent. are early, 60 per cent. advanced but able-bodied, and 20 per cent. disabled patients. Farming on the more satisfactory individual system and constructing houses afford most of the work on the 340 acres of land. One doctor forms the European staff, but a native one is being trained. In addition to the treatment of complicating diseases injections of the crude oil and esters combined with cod liver oil are used, and the production of a mild reaction with a single rise of temperature to from 99.2° to 99.6°F. is aimed at. With attention to detail it has been found that the children can be brought up from birth on good artificial foods and properly balanced diet without difficulty. The disease is believed to be spreading, so such well administered colonies as this are urgently needed, as well as out-lying dispensaries to meet the needs of further patients. L. R.

ADVIER (Marcel). La lèpre à Madagascar. [**Leprosy in Madagascar.**]—*Internat. Jl. Leprosy*. Manila. 1936. July-Sept. Vol. 4. No. 3. pp. 337-342. With 1 fig. (map).

The unsuccessful attempts to stamp out leprosy by compulsory isolation are narrated in this article. A law ordering isolation of all lepers has long been in force in Madagascar, and a number of leprosaria have been provided under missionaries. A new stringent law was promulgated in 1911 ordering isolation of all forms of the disease, and some 3,000 lepers are cared for in colonies and 300 in leper villages out of 6,000 believed to exist in the island. In 1915, 5,675 were enumerated, but are now believed to have been reduced to 3,000, chiefly through deaths during an influenza epidemic with 80,000 mortality in the island. Curative treatment is important, and has been too much neglected up to now. L. R.

DE MELLO (I. Froilano) & PEREIRA (O. Loyola). **Some Facts concerning Leprosy in Goa.**—Reprinted from *Indian Med. Jl.* Vol. 30. No. 7. 4 pp. With 1 chart.

Through the influence of Colonel de Mello, anti-leprosy work has been carried on in this French possession in India since 1925. Visits to the villages of known lepers revealed 240 active cases, and they are believed to total 300. A central colony was established in 1932 through which 179 lepers have passed and 140 are resident there, 67 only of whom are known to have had intimate contact with a leper. A few have been cleared of all symptoms and infectivity. L. R.

CEYLON. Sessional Paper XX.—1936. **Leprosy in Ceylon. Report of Second Visit of Investigation carried out from November 2 to December 5 by Invitation of Ceylon Government** [COCHRANE (Robert G.)]. 1936. Sept. 29 pp. Colombo: Govt. Press. [30 cents.]

This is a report on a second visit to Ceylon of a month's duration. Dr. Cochrane found considerable progress in the previous two and a-half years. The too rigid provisions of leprosy Ordinance have been suspended and a survey instituted. Compulsory measures are now

only used for isolating open infectious cases. Early neural cases in children should not be kept with open ones. An effective leprosy prevention centre has been organized in Colombo.

One object of his visit was to acquire further data on early infections in children, and by a re-examination of 61 under the age of 18 years approximately 67 per cent. were found to be improved or stationary without treatment, and nearly all who had become worse had a history of close contact with an infectious case, but he admits the numbers are small. Good follow-up work had been done in connexion with some of the clinics. Most of the report is taken up with details of local conditions and suggestions for improvements.

L. R.

MILLS (Clarence A.). **World Leprosy in Relation to Climatic Stimulation and Bodily Vigor.**—*Internat. J. Leprosy*. Manila. 1936. July–Sept. Vol. 4. No. 3. pp. 295–314. With 2 figs. [28 refs.]

This article attempts to explain the distribution of leprosy in relation to the effects of climate on bodily vigour. The author states that cool, changeable weather leads to high energy levels and active life, while prolonged moist heat has the opposite effect. He concludes that areas with a stimulation index below 3.0 are cursed with leprosy, with an index above 6.0 the disease becomes mild and less prevalent and above 12.0 the disease is only continued by the importation of cases. To explain the obvious exceptions he states that: "The last wave of leprosy in Norway coincided to a remarkable degree with a world-wide period of subnormal temperatures and increased storminess. On the other hand, when the disease spread with such virulence over Europe in the Middle Ages, the earth was under the influence of a major heat wave that sapped the vigor and vitality of population masses in temperate zones." He therefore advocates the Utopian measures of the segregation of lepers in the most stimulating regions available and the removal of the children of lepers to the same areas, as well as "the use of artificial climatic stimulation by indoor air-conditioning methods."

L. R.

ALEIXO (A.). *Investigação, epidemiologia, estatística de lepra—da sua importância na profilaxia da endemia leprosa.*—*Brasil-Médico*. 1936. May 2. Vol. 50. No. 18. pp. 377–379.

TESCH (J. W.). *Iets over lepra in Midden-Celebes en de leprozenkampong bij Paloe.*—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Nov. 3. Vol. 76. No. 44. pp. 2829–2840.

TRUONG-VAN-QUE. *De la lutte antilépreuse en Indochine.* [**Leprosy Control in Indo-China.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. May. Vol. 14. No. 5. pp. 408–411.

In this brief paper the author first quotes the suggestion of MONTEL to adopt milder measures against leprosy than compulsory segregation, including treatment in dermatological clinics, but thinks the Indo-China government will hesitate to free all lepers. He therefore suggests that uninfected cases should be set at liberty, and to distinguish these he considers that four injections of methylene blue should be given, and those whose lesions become coloured blue should be classed as dangerous.

L. R.

ANDERSON (Hamilton H.). **The Possibilities of Chemo-Prophylaxis in Leprosy.**—*Folha Med.* 1936. July 25. Vol. 17. No. 21. pp. 311–313. [20 refs.]

The author makes suggestions based on an hypothesis for the verification of which he has no clinical material. After references to some recent literature on the use of dyes in leprosy and the possibility of nasal infection, he suggests that dyes, possibly combined with chaulmoogra preparations, might be applied to the nasal area of newborn susceptible individuals in leprosy households, and in another experimental group dilute solutions might be applied frequently to the skin during the first three years of life as a prophylactic measure.

L. R.

RODRIGUEZ (Jose). **Our Leprosy Problem in the Philippines.**—*Monthly Bull. Bureau of Health.* Manila. 1936. May. Vol. 16. No. 5. pp. 161–179. With 3 figs. [11 refs.]

The author considers whether the costly segregation system of the past 28 years might not be modified with advantage.

In a brief review of compulsory segregation measures in other countries he points out that little success has been obtained except in Norway. The well-known attempt to enforce segregation in the Philippines is then narrated, during which hiding lepers had "to be hunted like wild beasts. Not a few were shot down resisting arrest." In 1920 improved treatment enabled some cases to be paroled with good effect, and in 1928 treatment stations for hopeful positive cases increased voluntary admissions to such an extent that during the last five years 75 per cent. of admissions to them have been entirely voluntary. Skin dispensaries have also proved of value. "In other words, the Government is now trying to cure them at the earliest stage possible and before there is need of isolating them. The present policy is certainly more logical, more humanitarian, and much more economical than the former one."

The later part of the paper deals with the results of segregation, which is illustrated by a curve. This shows a fairly steady rise in the number of segregated lepers, which only include bacteriologically positive cases. The early rise was due to the gradual discovery of cases. The curve flattened out from 1923 to 1927, the subsequent rise being due to opening of local detention and treatment stations in addition to the great Culion settlement, with the attraction of earlier cases. Further, the new cases segregated year by year have been becoming earlier ones (although, unfortunately, the figures of the number found each year are not available), and that advantage is not brought out by the curve. The death rate has also much decreased, and this adds to the numbers remaining segregated. In the Cebu Province there has been a slight fall in the new cases.

L. R.

DENNEY (O. E.). **The History of Leprosy in Louisiana.**—*Public Health Rep.* 1936. July 31. Vol. 51. No. 31. pp. 1029–1034.

This is a brief account of the well-known leprosy infection of this Southern United States province, partly by French families from Canada and partly by negro slaves from Africa. Whites still show the greater number of cases. The Carville settlement was founded in

1894, and became a federal institution in 1921, and still contains 94 Louisiana patients, no decrease having resulted from the compulsory segregation. L. R.

LUTZ (Adolpho). **Transmission of Leprosy and Prophylactic Indications.**

—*Mem. Inst. Oswaldo Cruz.* 1936. Vol. 31. No. 2. pp. 383–390.

Writing with half a century of experience the author discusses transmission and prophylaxis. Although due to a germ he holds that it is not contagious, and he prefers to call the organism a *Coccothrix* rather than a *Mycobacterium*. He points to the failure of inoculation experiments as against direct contagion, and concludes that it must be transmitted by a living agent. He then discards all bloodsucking insects except the mosquito, such as fleas, lice, bugs and mites, on account of their ubiquitous occurrence, and concludes that the mosquito must be the carrier. This leads him to advocate mosquito protection as the one effective prophylactic measure against leprosy, and this should not be postponed “any longer, on the plea that experimental proof has not been given.” L. R.

COCHRANE (Robert G.). **Prevention of Leprosy with Special Reference to Children.**—Reprinted from *Jl. Christian Med. Assoc. India, Burma & Ceylon.* 1936. July. 12 pp.

——. **Early Leprosy.**—*Ibid.* Sept. 4 pp.

——. **Leprosy in Children in Ceylon.**—*Leprosy in India.* 1936. Oct. Vol. 8. No. 4. pp. 147–150.

The author emphasizes the very generally acknowledged importance of protection of children from infection in attempts at prophylaxis. After mentioning the figures in his recent Ceylon report (1935) on the frequency of mild cases among children, he expresses the opinion that superinfection with the development of severe types may result from mild cases being exposed to further infection, and he is in agreement with MUIR and others regarding the importance of diet and good economic condition in increasing resistance to the disease. He thinks when the incidence is low in children in any place the problem is not serious there. He agrees in the importance of observation of contacts, and the isolation of infective cases, leper villages being advocated where settlements are not practicable.

In a further paper on early leprosy he also deals with mild cases in children, and gives a brief description of the early symptoms. L. R.

LOWE (J.). **A Study of Macules in Nerve Leprosy with Particular Reference to the “Tuberculoid” Macule.**—*Leprosy in India.* 1936. July. Vol. 8. No. 3. pp. 97–112. With 35 figs. on 7 plates.

The author discusses the high incidence in Calcutta of macular lesions with the occurrence of tuberculoid changes, and describes in detail the clinical, pathological and bacteriological features of the types of macule seen in nerve cases, with a number of good photos of the naked eye and two of the microscopical appearances. Acid-fast bacilli were found in practically all the active macules, and they had a marked tendency to heal spontaneously. He considers that the different types of macule seen in nerve leprosy are manifestations of a tuberculoid

type of inflammatory changes in different stages of activity and quiescence. Caseation may result from marked reaction of the tissues to the ordinary acid-fast organisms, and not to a special strain or filter passing form, or to trophic nerve disturbance. The more acute inflammatory changes in tuberculoid lesions have been attributed to lepra reaction, but they are followed by subsidence, and not by the increase of the leprous infection following reactions in nodules. In a classification the neural, or maculo-anaesthetic, lesion should be distinguished from the nodular or cutaneous type as the macular lesions have a very much better prognosis. *L. R.*

WADE (H. W.). **Regional Variations of Leprosy with Special Reference to Tuberculoid Leprosy in India.**—*Indian Med. Gaz.* 1936. Nov. Vol. 71. No. 11. pp. 653-659. [22 refs.]

This is an interesting contribution to variations in the incidence of the tuberculoid type of lesion in different countries and areas, partly based on a recent four months' investigation in India. The author points out that the great variations in the types of leprosy in different countries may lead to descriptions of the disease based on experience in one area being far from correct as applied to another region. This is brought out by variations in the proportion and severity of the nerve and cutaneous forms; for in India, and especially in Calcutta, the mild neuro-macular or tuberculoid type is unusually common, and the severe nodular cutaneous comparatively rare, especially in comparison with the great incidence of the latter in Japan. The proportion of serious eye complications illustrates this point, for the proportion varies from 1 per cent. in Culion and the Federated Malay States, through 2.9 per cent. at Purulia in India, to 8.6 per cent. in the U.S.A. Carville colony, and 18.2 per cent. at Zensei in Japan. Alopecia is also common only in Japan and South Africa, and cold abscesses in the nerve trunks only in India. In conclusion he pays a tribute to the work of the Calcutta Research Centre at the School of Tropical Medicine. *L. R.*

JUNIOR (Rabello). Novas provas contrarias á inclusão da variedade tuberculoide da lepra na forma nervosa. [**Tuberculoid Leprosy: Reasons for not regarding it as of the Nervous Form.**—*Brasil-Medico.* 1936. May 9. Vol. 50. No. 19. pp. 397-398.]

This article is a discussion of the question of the classification of tuberculoid leprosy. Laboratory returns show that the serum reaction of Witelsky, Klingenstein and Kuhn is positive in about 90 per cent. of lepers suffering from the cutaneous form and about 70 per cent. with the nervous form, whereas in tuberculoid leprosy the proportion of positives is less than half. We must distinguish, says the author, miliary ulcerous tuberculosis and cutaneous leprosy with visible bacteria on the one side, and tuberculides and tuberculoid leprosy, with sarcoid and tuberculoid forms, but without recognizable bacilli on the other. Tuberculoid leprosy in his view is a "variant" in the evolution of normal leprosy, neither cutaneous nor nervous. He presents a scheme of classification in which he places it under the group of the early or transitional phase of the cutaneous form, with focal inflammation, bacilli scarce or absent, and subdivides it into (1) cuticular nodules; (2) subcuticular nodules; (3) serpigenous; (4) erythematous; and (5) follicular or lichenoid. When the leprosy is in a later stage, with bacilli abundant, he calls the lesions *lepromata* and distinguishes

five types: erythematous, tubercous, nodular, papular and infiltrative. [Whether such distinctions can be clearly made out between lepromata and tuberculoid leprosy, and the various subdivisions of each, can only be determined by those with long experience.] H. H. S.

HUIZENGA (Lee S.). **Development of Leprosy Clinics in the Control of Leprosy.**—*Amer. Jl. Public Health*. 1936. Sept. Vol. 26. No. 9. pp. 883-887.

After a reference to such old leprosy clinics as that at the hot sulphur springs about Kasatsu in Japan and some in China, the author points out that a chain of "leprosy clinics now girdles the world" and is replacing forced segregation, and he advocates the organization in all leprosy areas of large central clinics, with surrounding small out-lying ones to reach as many cases as possible, such as are now found in India, the Philippines and the Dutch West and East Indies. In China 80 per cent. of such clinics are carried on at special times in general hospitals, and 20 per cent. associated with leprosaria, the latter being the more efficient, and they are nearly all carried on by missionary bodies, but in view of China being the most heavily infected area in the world he concludes: "What are these among so many?" L. R.

LARA (C. B.). **The Problem of the Follow-up of "Negative" Lepers.**—*Monthly Bull. Bureau of Health*. Manila. 1936. Feb. Vol. 16. No. 2. pp. 39-47.

SAMSON (Jose G.). **On the Follow-up of the Released Negative Leper.**—*Ibid.* May. Vol. 16. No. 5. pp. 180-186.

These two papers give somewhat conflicting data. Lara, after pointing out that there is no provision for the systematic periodic examination of relatives and other contacts of known lepers, goes on to point out that the regulations for following up the discharged "negative" lepers, now amounting to approximately 3,500, and providing them with further treatment, are very inadequately carried out for want of sufficient staff and funds. He asserts that, judging from the findings of isolated surveys, probably 46 per cent. or more have already relapsed and may become a danger, although no evidence is adduced that any healthy persons have actually been infected by such.

Samson also admits the inefficiency of the present follow-up system, but states that in one examination of paroled negatives, 22 of 288 were found to have become bacteriologically positive, or only 8 per cent., but points out that repeated examinations at intervals would reveal a higher figure. Improvement in the follow-up system is advocated.

L. R.

PLANTILLA (Fidel C.). **Transmission of Leprosy. I. Sites of the Single Leprotic Lesions.**—*Monthly Bull. Bureau of Health*. Manila. 1936. Apr. Vol. 16. No. 4. pp. 137-141. With 3 figs.

This paper deals with the surface distribution of single, but established, leprotic lesions in 266 early cases seen at the Philippines Cebu skin dispensary. The most frequent locations were on the cheeks, elbows, extensor surfaces of the forearms, buttocks and knees, especially in children under 14 years, and they were fairly frequent on the arms, hands, fingers, legs and feet, but rare on the chest, abdomen, back and

thighs. He points out that the most infected areas are the exposed surfaces of the body most lain upon when being carried and when sitting and playing, and most subject to direct skin contact between the mother and child. These facts indicate direct infection from contact with the mothers or with the chair, floor, bedding or soil. L. R.

DOW (D. P.). **Late Results of Nerve Decapsulation in Leprosy.**—*Leprosy in India*. 1936. July. Vol. 8. No. 3. pp. 113–118.

The author records the later results in eighteen cases of nerve decapsulation, mainly for the relief of agonising pain by removal of the nerve sheath at the main seat of pressure. Unfortunately the periodic re-examination of such patients has not confirmed the sanguine hopes of this operation, for in no case has the improvement been maintained, and in some the condition had become worse than before the procedure. This is due mainly to fibrous tissue formation at the site of the operation and to pressure on other parts of the nerve by the disease process. An alternative and better treatment is intradermal injection of the Hydnocarpus esters along the course of the thickened nerves. In the case of abscess formation along a nerve the caseous material should be removed and the wound closed without drainage. L. R.

MUIR (Ernest). **Prognosis in Leprosy. I & II.**—*Lancet*. 1936. Aug. 15 & 22. pp. 391–392; 448–449.

The main points in this informative article based on an immense experience are the following:—The two main factors are the concentration and distribution of the lepra bacilli in the body and the resistance of the patient to the infective process. Localization of the disease to one or more nerves and the adjacent skin implies high resistance and a good prognosis as long as the general health of the patient is maintained, as there is a tendency to resolution. In more general infections of the skin and nasal mucous membrane, with abundant lepra bacilli and infiltration of the dermis, the prognosis is much more serious. General resistance is least in early childhood, when exposure to infection most commonly leads to serious disease, but the older the child on first exposure the more likely is the infection to prove mild. A high erythrocyte sedimentation reading and negative or weak leprolin tests indicate low resistance. Extensive distribution of nodular lesions containing many bacilli and the appearance of rapidly growing new lesions furnish a grave prognosis; but few macules with thickening or tenderness of connected nerves and few bacilli in the macules are favourable points. Any debilitating complicating disease is a grave handicap. L. R.

LEFROU (G.) & DES ESSARTS (J. Quérangal). Contribution au diagnostic des faux lépreux. (Deuxième mémoire.) Les macules dyschromiques d'épidermomycose. [Diagnosis from Skin Fungal Diseases.]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 743–749.

The authors discuss the differentiation of leprotic lesions from those of *Microsporon furfur* and *Pityriasis versicolor*. For this purpose they rely mainly on the absence of loss of sensation in the later fungal infections of the skin and on finding their respective causative vegetable parasites by microscopical examination. L. R.

MARCHOUX (E.) & CHORINE (V.). La sensibilité au virus lépreux n'est pas plus grande chez les jeunes que chez les adultes. [**Susceptibility to Leprous Virus is no greater in the Young than in the Old.**]—*Ann. Inst. Pasteur*. 1936. Dec. Vol. 57. No. 6. pp. 583–596. With 3 figs.

This paper deals with the susceptibility to leprous infections based on experiments on rat leprosy. The frequent contamination of young children by their leprous parents is emphasized, and this is confirmed in the case of inoculated rat leprosy by the much greater extent of the lesions, and active infection by much smaller doses, of young than of old rats. Again, in the case of the rat disease hereditary infection is not proved, and they are not in agreement with the hypothesis of some American writers that a hypothetical virus stage of the lepra bacillus is the cause of infection and not the bacilli themselves. Adult rats may become infected by surprisingly brief contact with infected rats in the ulcerative stage. Experiments made in their laboratory prove the passage through porous bougies of typical bacilli of Stephansky, and the non-existence of an ultra microscopical virus. They also hold that the lepra bacilli frequently reported to have been found in the cords of newly-born infants are dead organisms. They conclude that the frequent infections of young children are due more to the facilities for their infection than simply to their greater susceptibility. L. R.

ITAKURA (Teiju). Zahnärztliche Untersuchungen bei Leprakranken. III. Bericht: Klinische Betrachtungen der leprosen Mundhöhlen-Veränderungen bei leprakranken Formosa-Chinesen (Fokien-Stamm).—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Nov. Vol. 35. No. 11 (380). [In Japanese pp. 2474–2489. [27 refs.] German summary pp. 2489–2491.]

LIE (H. P.). **Tracheitis and Bronchitis Leprosa.**—*Internal. Jl. Leprosy*. Manila. 1936. July–Sept. Vol. 4. No. 3. pp. 281–288. With 8 figs. on 2 plates.

This is an illustrated account of the macroscopical and microscopical lesions found after death in the trachea and bronchi. In certain cases these may be extensive. Traumatism of various kinds may produce or predispose to such lesions. The leprosy bacilli may pass through the mucous membrane to invade the deeper tissue without producing any macroscopic lesions of the mucous membrane. L. R.

- i. LAMPE (P. H. J.). Motiveering en uitvoering van een onderzoek naar omstandigheden en verhoudingen in leprarijke en lepra-arme gebieden. [**Investigation in Leper Countries.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Aug. 25. Vol. 76. No. 34. pp. 2117–2123. English summary.
- ii. DARWIS (A.). Het lepra-onderzoek in Lamongan. [**Study of Leprosy in Lamongan.**]—*Ibid.* pp. 2123–2128. English summary.
- iii. SOETOMO (R.). Enkele stellingen over de lepra [**Some Points in Leprosy.**]—*Ibid.* pp. 2129–2132. English summary.
- iv. THIERFELDER (M. U.). Enkele opmerkingen over het ontstaan der lepra. [**Remarks on the Aetiology of Leprosy.**]—*Ibid.* pp. 2133–2137. English summary.

- v. FISCHER (J. A.). Tuberculinetherapie bij lepra. [**Treatment of Leprosy by Tuberculln.**]*—Ibid.* pp. 2138–2146. With 1 plate. English summary.
- vi. LAMPE (P. H. J.) & DE MOOR (C. E.). Ratten-Lepra. Vierde mededeeling: Zuurvaste saprophyten; aantekeningen bij het kweekonderzoek van rattenlepra. [**Attempts at Cultivation of the Organism of Rat Leprosy.**]*—Ibid.* pp. 2147–2153. With 2 figs. on 1 plate. English summary.
- vii. MÜLLER (H.) & SOETEDJO MERTODIDJOJO. Doodsoorzaken en viscerale afwijkingen bij lepralijders in Oost-Java. [**Findings in Autopsies on Lepers in East Java.**]*—Ibid.* pp. 2174–2184. With 5 figs. on 1 plate. [18 refs.] English summary (8 lines).

The following are the main points of interest in this series of papers.

i. Dr. Lampe pleads for investigation of the reasons for the variable incidence of leprosy in different countries, and mentions the initiation of one.

ii. A. Darwis records the frequency of infections among brothers and sisters.

iii. R. Soetomo finds most infections originate in rural districts.

iv. M. U. Thierfelder assumes that infection is transmitted through an intermediate host, and suspects the body louse as the agent.

v. J. A. Fischer reports on the use of tuberculin combined with injections of leprolin with hopeful results.

vi. Lampe and de Moor record negative attempts to cultivate the rat leprosy bacillus, only saprophytic acid-fast bacilli growing.

vii. H. Müller and S. Mertodidjojo report on 225 autopsies and found tuberculosis and pneumonia the main causes of death and lesions in the testes and spleen to be common.

L. R.

DES ESSARTS (J. Quérangal) & LEFROU (G.). Evolution des léprides en lépromes. [**Evolution of Leprides and Lepromes.**]*—Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 945–949.

The author states that DARIER contended that anaesthetic macules are of the same nature as nodules with every gradation between them, but the present writers makes the following distinctions:—Clinically the former show much less thickening of the skin. Histologically the nodules present a granulomatous appearance which is not so marked in the other type. Bacteriologically the organisms are very numerous in the nodules but scanty in the nerve macules.

L. R.

CLOUSTON (Thomas M.). **An Investigation into the Thick Blood-Drop Method of Diagnosis in Leprosy.***—Med. Jl. Australia.* 1936. Sept. 26. 23rd Year. Vol. 2. No. 13. pp. 430–432. [13 refs.]

Working in the Island of Nauru, where early diagnosis is of such great importance in the successful campaign against a serious epidemic of leprosy, the author describes a simple method of searching for lepra bacilli in blood obtained by puncturing the skin after rejecting the first drops. A thick drop of blood is dried in the air, dehaemoglobinized in distilled water, dried again and stained by the Ziehl-Neelsen method. Nodular cases were first investigated with positive results in 77·7 per cent. Thirty-six segregated cases with milder cutaneous lesions gave only two positive results. The results were negative in all of 21 early patients attending out-patients clinics, and also in ten suspects and eight

children of lepers. These results support those of Lowe in India. The method is thus of no practical use in the detection of early or latent leprosy. L. R.

ANDERSON (Hamilton H.), CERQUEIRA (Paulo), ANDERSON (Jeanette van D.) & PORTUGAL (H.). **Clinico-pathologic Studies of Leprosy in Brazil.**—*Amer. Jl. Trop. Med.* 1936. Nov. Vol. 16. No. 6. pp. 689-697. With 2 figs.

Leprosy in Brazil shows no preference as regards sex, but those of the white race are attacked twice as frequently as the coloured, and the majority are labourers, domestics or engaged in trade. The lower extremities are first involved, and after five years more than half the body may be affected, with lepra bacilli in the skin and nasal mucosa and in half the specimens of gland lymph. Patients improve on a good diet in a leper institution, and often suffer from worms and kidney damage, the latter complicating drug treatment. Complement fixation tests were positive in 64 per cent. The blood showed high lipids and fatty acids and low cholesterol, and these changes are not much altered by chaulmoogra treatment, the use of which should be preceded by clinico-pathologic study. L. R.

GRIECO (Vicente). Aspectos histológicos das nevrites na lepra. [**Histology of Nerve Lesions in Leprosy.**]—*Rev. Brasileira Leprologia.* S. Paulo. 1936. Sept. Vol. 4. No. 3. pp. 271-305. With 25 figs. [12 refs.] English summary.

Those interested in the pathological histology of leprosy will find much of interest in this article. The author is in the fortunate position of having abundant pathological material at his disposal and he clearly makes good use of it. He describes first the lesions of the nerves as found in the usual nodular form of the disease. In these he finds the bacilli numerous among the nerve fibres bringing about compression and secondary destruction. Next, in cases of purely nervous leprosy, he finds between the fibres small foci of infiltration with numerous lymphocytes and at a later stage fibrosis; bacilli are very scarce, and in some cases lime salts are deposited. Thirdly, in the nerves of tuberculoid lesions, infiltration of epithelioid cells is seen in the nerve fibres, together with lymphoid and giant cells, caseation and calcification may occur, but Hansen's bacilli are very scarce and in many cases none can be found. Lastly, lesions of the nerve terminals in maculae, lepromata, etc. Here small infiltrations may be visible in the sheath in the early stages; later the filament itself is invaded and the fibre compressed and ultimately destroyed. There are good photomicrographs illustrating the conditions present. H. H. S.

ERMAKOVA (Nina). Studies on Leprosy. I. The Central, Sympathetic and Peripheral Nervous Systems.—*Internat. Jl. Leprosy.* Manila. 1936. July-Sept. Vol. 4. No. 3. pp. 325-336. With 5 figs. on 1 plate. [14 refs.]

WANSER (Robert). Ueber die Eosinophilie bei Lepra. [**Eosinophilia in Leprosy.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 505-508.

The author records blood counts in 26 cases of leprosy with an eosinophilia varying from 6 to 16 per cent. in eleven of them. After

expelling by treatment worms of various kinds the count fell to normal, so an increase is due to complications. A high degree of lymphocytosis, such as 70 per cent., is also of no significance. *L. R.*

POOMAN (A.). Weitere Erfahrungen bei der Färbung von Lepra- und Tuberkelbakterien. [**Staining Tubercle and Leprosy Bacilli.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Dec. Vol. 40. No. 12. pp. 533-538.

As the result of his investigations he holds that the lepra and tubercle bacilli are not strictly alcohol- and acid-fast organisms. *L. R.*

HAZEN (H. H.), PARRAN (Thomas), SANFORD (Arthur H.), SENEAR (F. E.), SIMPSON (Walter M.) & VONDERLEHR (R. A.). **The Occurrence in Leprosy of Positive Serodiagnostic Tests for Syphilis. Report of Results obtained in an Evaluation of Serodiagnostic Tests for Syphilis in the United States.**—*Venereal Dis. Information.* 1936. Sept. Vol. 17. No. 9. pp. 253-259. [14 refs.]

This is a comprehensive study of the Wassermann group of tests on 1,017 specimens sent to each of thirteen serologists, summarized as follows:—

"1. A total of 59.5 per cent. of the serologic reactions from leprosy patients were positive. The complement fixation tests showed 53 per cent. positive and the flocculation tests showed 62.4 per cent. positive.

"2. The percentage of positive tests is somewhat higher among patients with advanced leprosy, or in those showing numerous organisms in the lesions.

"3. It is still impossible to say whether the anesthetic, nodular, or the mixed form of leprosy yields the highest percentage of positive reactions.

"4. There is a marked discrepancy in the results obtained with comparable specimens of blood sent to various serologists.

"5. Up to the present time no evidence has accumulated to indicate that a disease caused by an acid-fast bacillus will give positive flocculation or complement fixation reactions for syphilis. It would seem logical to suggest that the entire question of the etiology of leprosy is in need of reinvestigation.

"6. It seems apparent that yaws is not the cause of many positive serologic reactions for syphilis among lepers in the United States."

L. R.

ROSE (F. G.). **Treatment of Out-Patients at the British Empire Leprosy Relief Association Clinics in British Guiana.**—*Brit. Guiana Med. Ann. for 1936.* pp. 78-82.

Since the passage of the new British Guiana ordinance, for the first time limiting compulsory segregation to open bacteriologically positive cases, an increasing number of early cases have been treated at clinics, the initial cost of which was provided by the British Empire Leprosy Relief Association. In this paper Dr. Rose records the results of systematic treatment carried out in them up to approximately six years with increasing intervals between the doses, and he compares the results in these early cases with those of RODRIGUEZ in the Philippines, who considered that chaulmoogra preparations had little effect in the early neural cases which formed the great majority of Rose's cases. Dr. Rose classes as "arrested" cases those in which the lesions have disappeared and remained absent for two years, as "much improved"

those in which most of the symptoms have disappeared, and cases with a lesser degree of progress as "improved." He emphasizes that in his experience regularity of treatment is as important as its duration; 113 early cases are analysed on the lines of RODRIGUEZ, and in a second table 73 cases are given showing the degree of regularity of treatment by dividing them into those that received up to 60 per cent. of the course of injections advised and those receiving from 61 to 100 per cent. of them. In the first class only 16.7 per cent. were "arrested" after over 48 months treatment, in the latter, receiving more regular treatment, 41.7 per cent. had become arrested after 25 to 36 months, and 71.4 per cent. after 37 to 48 months' treatment. He therefore concludes that although the number is statistically small "there is nothing in them to contradict the view that early cases treated with regularity over long periods, equally with more advanced cases, prove amenable to treatment with Hydnocarpus products."

Duration of Treatment	Regularity of treatment (percentage of expected number of injections actually received during the period of treatment).												
	0 to 61 per cent.						61 to 100 per cent						
	Cases	Arrested	Much improved	Improved	Stationary or worse	Percentage arrested	Cases	Arrested	Much improved	Improved	Stationary or worse	Percentage arrested	No. arrested
13-24 months	9	0	0	3	6	0	14	0	2	9	3	0	23
25-36 "	12	0	0	1	11	0	12	5	2	2	3	41.7	24
37-48 "	4	0	0	1	3	0	7	5	0	1	1	71.4	11
Over 48 months	6	1	0	0	5	16.7	9	6	0	2	1	66.7	15
Total ...	31	1	0	5	25	3.2	42	16	4	14	8	38.1	73

L. R.

- i. DE MELLO (I. Froilano). **Treatment of Leprosy by Intravenous Injections of Pure Chaulmoogra Oil.**—Reprinted from *Med. Digest*. 1935. Aug. Vol. 3. No. 5. pp. 160-162.
- ii. —. **Traitement de la lèpre d'après trois ans d'expérience personnelle. [Three Years' Experience of Treatment.]**—Copia ex 2nd volumine deliberationum IX Congressus Internationalis Dermatologorum. 4 pp.

i. The author first reports negative results from the use of vaccines of Friedman bacilli, and little benefit from either antimonial preparations or methylene blue, so he remains a decided partisan of chaulmoogra, as a result of trials among the 109 lepers in the Goa leprosarium. He has used alepol, esters, etc., but has also now given 1,380 intravenous injections of pure neutralized chaulmoogra oil without any accident. The results are very encouraging with 9 discharged cured and 20 more much or very much improved.

- ii. This paper deals with the same work.

L. R.

FLANDIN (Charles), BARANGER (Pierre) & RAGU (Jean). Essai de traitement de la lèpre par un complexe nouveau de chaulmoogra et de cholestérol, permettant l'injection intraveineuse à haute dose de dérivés chaulmoogriques. [**New Treatment by a Combination of Chaulmoogra and Cholesterol.**—*C. R. Acad. Sci.* 1936. Aug. 31. Vol. 203. No. 9. pp. 502-504.

The authors first point out that chaulmoogra preparations have proved the most efficacious in the treatment of leprosy, but that their use by a number of workers by intravenous injection has been handicapped by the production of local and general reactions. They go on to report that Pierre Baranger has prepared a number of esters of amino-alcohol, which under certain conditions unite with cholesterol to produce remarkable, crystalline, non-haemolytic substances giving fine ultra-microscopical stable suspensions suitable for intravenous injections, and which can be sterilized at 115°C. One cc. contains 20 to 40 mgm. of the preparation. This new preparation has now been tried in 12 cases of leprosy in Paris at the Hospital Saint-Louis, 1,500 ampoules having been given with perfect tolerance by slow injection, after drawing up blood into the syringe, in doses up to 6 to 7 cc. The results show in early or acute cases arrest of the evolution of the disease, and in more advanced nerve cases a stabilization of the condition, always with a rapid disappearance of the lepra bacilli and a rapidity of action much in proportion to the dosage. Its complete harmlessness leads the authors to hope that real progress has been made in the treatment of leprosy.

L. R.

V. ORTENBERG (Heinz). Die Verbreitung der Lepra und ihre Behandlung in den deutschblütigen Bevölkerungskreisen Süd-Brasiliens. [**Leprosy Treatment in South Brazil.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 503-505. With 1 fig.

The author gives a short description of the high incidence of leprosy at Santa Cruz in South Brazil with infection of the German colony as well as the negroes. In its treatment are used chaulmoogra preparations, including caestrol, by the oral, parenteral and intravenous routes.

L. R.

TOLENTINO (Jose G.). **How Effective is the Treatment of Leprosy with the Chaulmoogra Oil Group?**—*Monthly Bull. Bureau of Health.* Manila. 1936. Feb. Vol. 16. No. 2. pp. 48-51.

The author first refers to the differences of opinion regarding the value of the chaulmoogra treatment of leprosy and the frequency of relapses, and then deals with his five years' experience at a Cebu Philippine treatment centre. Out of 75 patients treated at the centre after the transfer of others to Culion, 37, or 50 per cent., were already paroled and 12 per cent. more were in the negative list, and another 29 per cent. were improved, and only 3 per cent. worse. Three of the paroled cases had relapsed. The present treatment therefore is very far from being useless.

L. R.

COLE (Howard Irving) & CARDOSO (Humberto T.). *Estheres ethylicos de chaulmoogra*. [**Ethyl Esters of Chaulmoogra**.]—*Rev. Brasileira Leprologia*. S. Paulo. 1936. Sept. Vol. 4. No. 3. pp. 333–340. With 1 chart. English summary (8 lines).

"The factors involved in esterification of chaulmoogra oils are discussed, including experiments on the influence of sulphuric acid as a catalyst on reaction rate. The variation of refractive index and optical rotation of ethyl esters with percentage of free fatty acid is demonstrated.

"Methods of esterification and purification of ethyl esters are given as well as directions for the preparation of creosoted and iodized esters."

VAN BREUSEGHEM (R.). *Le solganal associé aux ethyl esters de chaulmoogra dans le traitement de la lèpre*. [**Solganal and Chaulmoogra Esters in Leprosy**.]—*Ann. Soc. Belge de Méd. Trop.* 1936. Sept. 30. Vol. 16. No. 3. pp. 379–386.

In view of the advocacy of this treatment by European workers the author reports on 15 cases in which he tried it in total quantities of solganal up to over four grams, combined with chaulmoogra esters, without obtaining any amelioration of the condition in a single case, and in all but one the disease slowly increased. L. R.

POOMAN (A.). *Zur spezifischen Leprabehandlung mit Kohlen-säureschnee und Solganal B oleosum*. [**Solganal B Oleosum Treatment**.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 465–470.

This author, however, once more advocates solganum in oil in the treatment of leprosy, and gives a table of blood counts made during its administration. L. R.

TALEC & MONTGLOND. *De l'influence de l'acidité de l'huile d'Hydnocarpus wightiana dans le traitement de la lèpre*. [**Acidity of Hydnocarpus Oils**.]—*Ann. de Méd. et de Pharm. Colon.* 1936. July–Aug.–Sept. Vol. 34. No. 3. pp. 460–471.

The authors consider that the active principle of chaulmoogra oils has not yet been established, and quote the opinion of STEVENEL that it is localized in the integuments of the grains. They therefore consider it advisable to administer the whole oil rather than the more generally used soluble derivatives from it. The acidity of the whole oil is of importance on account of rancid preparations containing excess of acidity, but that extracted from fresh ripe seeds of *Hydnocarpus wightiana* (as long used by E. MUIR for injection purposes) is nearly neutral, for its acidity measures only 2.5 to 5.0 of oleic acid. This may be mixed in the proportion of 200 grams with 90 grams of powdered gum arabic, 250 of simple syrup and 1,000 grams of "Lixiviation de café torréfié." Two cc. of this emulsion containing 4 grams of Hydnocarpus oil.

Encouraging results are claimed to have been obtained in the treatment of a large number of patients by oral administration. In Pondicherry, 28 cases were given 30 cc. each morning, and 21 continued this dose for thirty days without the least sign of intolerance, and in most slight alleviation of their symptoms was obtained. Subcutaneous and intramuscular injections of the pure oil have also been used for over 4,000 injections with no accidents. L. R.

BERNY (P.) & GIPPET (E.). Essai de traitement des ulcérations lépreuses au moyen de badigeonnages quotidiens avec une solution de bleu de méthylène au centième. [**Methylene Blue in Ulceration.**]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 851-854.

The authors advise the application of a solution of 1 per cent. of methylene blue to heal leprosy ulcers unaccompanied by necrosis of bones. *L. R.*

MONTEL (R.) & MONTEL (G.). Suite de quelques observations de lépreux publiées en 1932. [**Further Observations on Cases.**]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 857-859.

These writers report further on three cases treated in 1932 by collo-biase chaulmoogra. [See MONTEL (M. L. R.), this *Bulletin*, 1932, Vol. 29, p. 848.] The cases were tropho-neuritic and tuberculoid and all the symptoms disappeared and have remained absent. *L. R.*

TISSEUIL (J.). De l'action de la sanedrine-renaleptine, associées, dans les névralgies lépreuses. [**Sanedrine-Renaleptine for Leprous Neuralgias.**]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 854-856.

The author reports favourably on the suggestion of JEANSELME to use adrenaline and ephedrine in treatment of the neuralgic pains of leprosy. He uses ampoules containing 0.02 gm. of sanedrine and 0.0002 gm. of renaleptine injected daily for ten days, and repeated if necessary after a week or two interval. Four cases are recorded to illustrate its value. *L. R.*

VAN BREUSEGHEM (R.). Iode per os en thérapeutique antilépreuse. [**Iodine Therapy.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. Sept. 30. Vol. 16. No. 3. pp. 367-377.

The author has tested the claims of J. BARTMAN to have obtained good results in the treatment of leprosy by a 10 per cent. alcoholic solution of iodine. The present author has given from 20 drops to 3 cc. daily of 10 grains of iodide dissolved in 100 cc. of 95 per cent. alcohol for two and a-half months on six out of seven days, the course being repeated twice after intervals of ten and fifteen days. Although the treatment was well tolerated the results have been very unsatisfactory, with strong aggravation of the symptoms in 3, moderate aggravation in 8, slightly so in 7, and the remaining 4 of the 22 treated were stationary. *L. R.*

BERTELOTTI (L.). Tentativi di inoculazione della lepra umana nei ratti in avitaminosi. [**Results of Inoculation of Human Leprosy Tissue into Rats on Various Diets.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Oct. Vol. 17. No. 10. pp. 577-609. With 12 figs. [62 refs.]

The investigation undertaken was a laborious one, but the number of animals used was small. Eight groups of white rats, none of more than three, and sometimes two only, were inoculated with 1 cc. of an emulsion of human leproma in physiological saline beneath the skin of the

abdomen, into the skin of the ear and subcutaneously in the back. The animals were killed after, as a rule, 30, 60 and 90 days respectively and the tissues examined. The groups were given different diets: I. Normal for control; II. Avitaminosis A, Steenbock's diet; III. The same with the addition 3-5 drops of vogan daily (a synthetic product of vitamin A containing 40,000 units per cc.); IV. Avitaminosis B and C *plus* vitamin C ($\frac{1}{2}$ tablet of cebion); V. The same *plus* vitamin B (30 gm. dried yeast daily); VI. Avitaminosis C *plus* vitamin C; VII. Avitaminosis D; VIII. The same *plus* vitamin D (5 drops of vigantolo daily).

The results may be summarized by saying that avitaminosis did not, in these experiments, appear to bring about any reduction of defensive power or render possible the growth and propagation of leprosy; though the bacilli could be found even 90 days after inoculation they were usually undergoing degeneration. Occasionally signs indicative of multiplication were seen, but not sufficiently often to lead one to think that the conditions of the experiments played any active part.

H. H. S.

SELLARDS (M. A. W.) & PINKERTON (H.). Résumé d'expériences sur la propagation de la lèpre murine et humaine à des animaux considérés comme réfractaires. [**Propagation of Rat and Human Leprosy in Other Animals.**]*—Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 847-851.

The authors have obtained the following important results from the investigations recorded in this short paper. Progressive and fatal infections with rat leprosy have been obtained in *Macacus rhesus* monkeys, rabbits and white mice. Rapid development of the disease following injection of rat leprosy bacilli into the brain or spleen. Histological studies showed that the bacilli multiplied solely in the cytoplasm of the reticulo-endothelial system.

Attempts to propagate human lepra bacilli in mice did not give encouraging results, but in the case of the monkey moderate numbers of acido-resistant bacilli were found after two passages and two years after the first inoculation. Extensive lesions have, however, never been observed either at the site of inoculation or in distant organs.

L. R.

LAMPE (P. H. J.), DE MOOR (C. E.) & VAN VEEN (A. G.). Rattenlepra. [**Rat Leprosy.**]*—Geneesk. Tijdschr. v. Nederl.-Indië.* 1936. Sept. 1. Vol. 76. No. 35. pp. 2204-2227. With 9 figs. on 2 plates. English summary.

The authors have carried out experiments to try to ascertain if the virus of rat leprosy is present as a saphrophyte in the soil. In all, 95 white rats have been kept in contact with mud from native houses with heavy rat leprosy infection after shaving their bellies to the point of bleeding weekly. In some the mud was well rubbed into the skin of the abdomen eight times, and some of the rats were kept on low vitamin diets, with a high mortality among them. Nearly 300 rats used for dietetic experiments without being shaved served as controls. Microscopical examinations of the skin of the abdomen sometimes

showed acid-fast rods with a morphology different from that of rat leprosy bacilli, so evidently saprophytic. In eleven rats, however, characteristic lesions of rat leprosy were found, and in a few periglandular, subcutaneous and skin lepromata were met with, and also a miliary development in enlarged internal organs, which gave the impression of being rat leprosy. Such lesions were only found after twelve months and ulceration and cachexia might supervene. B and B₂ hypovitaminosis appears to be necessary to produce infection. The infection was easily conveyed to adult rats subcutaneously or percutaneously, and the organism could not be cultivated. The control experiments were negative. In view of the necessity for lack of vitamin B complex for infection it appears unlikely that infected mud plays any great part in the natural spread of rat leprosy. L. R.

WATANABE (Yoshimasa). **Experimental Studies on Animals concerning Leprosy. Report VII. Filtration Tests of Virus of Rat Leprosy.**—*Kitasato Arch. Experim. Med.* 1936. Oct. Vol. 13. No. 4. pp. 348-353.

After reference to the work of MARKIANOS and others in passing the virus of rat leprosy through Chamberland L₂ filters, the author describes confirmatory experiments with that filter and possibly with L₃, but negative from the use of the Berkefeld filter. L. R.

TERADA (M.), TERADA (Y.) & NOZAKI (M.). **Studies concerning Human and Rat Lepra Bacilli and the Other Acid Fast Organisms. Part I. Biological Studies on Human and Rat Lepra Bacilli.**—*Kitasato Arch. Experim. Med.* 1936. Oct. Vol. 13. No. 4. pp. 333-347. With 10 figs. on 2 plates.

The authors separated both human and rat leprosy bacilli from tissues containing them in large numbers by mincing and centrifuging so as to separate the bacilli in a layer, and then repeatedly washed them. They then carried out the following biochemical tests with both varieties of organisms and obtained precisely similar reactions with each. Thus both gave catalase and lipase reactions, and neither gave oxydase, protease (caseinase), or amylase ones, and neither organism fermented monosaccharides, such as glucose, galactose and levulose.

L. R.

EMERSON (George A.). **Glucose Tolerance in Rat Leprosy.**—*Amer. Jl. Trop. Med.* 1936. Nov. Vol. 16. No. 6. pp. 699-703. With 2 figs. [10 refs.]

After quoting previous work showing little or no alteration in the normal blood sugar curve in uncomplicated human leprosy, the author goes on to record experiments on well developed rat leprosy produced by infecting white rats, with the result that he found slightly decreased fasting blood sugar and abnormally high and prolonged glucose tolerance curves in advanced rat infections. This indicates more extensive damage to the liver in the rat than in human leprosy infections. L. R.

CHORINE (V.). Essais du traitement de la lèpre murine. [**Treatment of Rat Leprosy.**]*—Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 949-952.

In this brief note the author records negative results from attempts to treat rat leprosy with aminophenilsulfamides of M. Fourneau, with thymol and menthol, with anthiomaline, which aggravated the infection, and with selenium. L. R.

YAMAMOTO (Kinzaburo), SATO (Masaru) & SATO (Yuzo). Rattenlepra ; Statistische Beobachtungen in Tokyo. [**Rat Leprosy in Tokyo.**]*—Japanese Jl. Dermat. & Urol.* 1936. July 20. Vol. 40. No. 1. p. 28.

The authors record the results of the microscopical examination of 2,573 rats in Tokyo for leprosy lesions with 32, or 1·24 per cent., of positive results. Acid-fast bacilli were found in the subcutaneous tissues, lymph-glands, nodules, and ulcers. In 29 of the 32 it was the *Rattus norvegicus* that was infected and in the remaining 3 in the *hibernicus* variety of that rat, but no infections were met with among 39 *Rattus rattus*. Of the glands the inguinal and axillary were most often infected, and of the internal organs the lungs, liver and spleen.

L. R.

DYSENTERY.

KESSEL (John F.), BLAKELY (Lee) & CAVELL (Korine). **Amoebiasis and Bacillary Dysentery in the Los Angeles County Hospital 1929-1935.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 417-430. With 2 figs. [14 refs.]

This article records the results of an interesting study and one of considerable practical importance from an epidemiological point of view. The work was carried out at the laboratory of the Los Angeles County Hospital between May 1932 and September 1935, stools from dysenteric or diarrhoeic patients or swabs obtained at sigmoidoscopic examinations being sent at once to the laboratory, where cyto-diagnosis and cultural attempts were made. *E. histolytica* was found in 319 (the average number of examinations per patient was three), dysentery bacteria in 922, Salmonella in 422, of over 10,000 patients. The Shiga organism was found in 38 only (over a longer period of six years, 1929-35), Flexner V in 518, the Y bacterium in 117, and the Sonne type in 249. Of the Salmonella, *S. morgani* was the most frequent, 276.

The following table is interesting from the clinical aspect :

Gastro-intestinal symptoms in individuals harbouring E. histolytica, Shigella and Salmonella.

Infection	Acute dysenteric symptoms	Chronic colitis without dysentery	Without subjective gastro-intestinal symptoms
	per cent.	per cent.	per cent.
<i>E. histolytica</i> ,* 319 cases ...	25	61	14
<i>Shigella paradysenteriae</i> , 694 cases	84	12	4
<i>Salmonella</i> , 246 cases... ..	72	16	12

* Twenty-nine cases of amoebic liver abscess among 319, or 9 per cent.

From this it will be seen that acute bacillary dysentery is much more frequently seen than acute amoebic, while chronic amoebiasis is more common than chronic bacillary dysentery. A special study was undertaken of an outbreak of Sonne dysentery which occurred in November 1932 and May-July 1934, in Southern California. It was found but seldom prior to this and also subsequently. In the case of the organism isolated, although the serological reactions were clear, lactose fermentation was much slower and less regular than usual and in comparison with five other strains. Fermentation occurred first under anaerobiosis, in Durham tubes of lactose broth or at bottom of a lactose agar slope. Without the Durham's tube fermentation occurred more frequently in nutrient broth than in the dibasic phosphate peptone medium.

H. H. S.

PANG KUO-HAO. Die Bedeutung der Dysenterie für China und ihre Bekämpfung. [**Dysentery in China and its Prevention.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 440-448.

A good account of the main features of amoebic dysentery as it affects China, dealing with its history, its geographical and seasonal

distribution, epidemiology, symptomatology, treatment and prophylaxis. The author thinks there is evidence of the disease existing there 3000 years ago; the distribution is widespread; in fact, the disease is endemic over practically the whole of China and at times assumes epidemic proportions. Of more importance is the chronic form with complications, notably, of course, hepatitis and abscess of the liver. Amoebiasis of animals—pigs in the north, cats and dogs in the south—must be taken into consideration in the investigation of the epidemiology. Prophylaxis must be along the usual lines of better hygiene and sanitation generally, improvement of the primitive methods of fertilization, and fly-prevention. For treatment, emetine, yatren, and certain plant products such as *Garcinia mangostana*; there is a great need of cheaper methods.

H. H. S.

ROBIC (J.). Note sur la dysenterie bacillaire à Madagascar, ses rapports avec les autres dysenteries. [**Bacillary and Other Forms of Dysentery in Madagascar.**]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1126–1131.

The statement has been made that in Madagascar dysenteric diarrhoea has been observed in association with helminthic infestations—*Schistosoma*, *Ancylostoma*, *Ascaris* and *Trichuris*—and with amoeba, but that attempts to isolate any bacilli of dysentery were negative.

The author reports that in an outbreak at the beginning of 1928 *Bact. shigae* and the Hiss organism were isolated. In 1933, GIRARD concluded that bacillary dysentery was widespread fairly generally throughout the Colony. In Antananarivo, in 1934, ten positive were found, two of them Europeans, in 1935, seven in all, two Europeans, in 1936, two in the first two months. Of a total of 21 positive by agglutination, 9 reacted with Hiss' organism, 3 with the Flexner and the remainder with Shiga's.

E. histolytica was found in 7 cases of acute intestinal disturbance in 1934, six of them being in Europeans, in 1935, thirty-three positive, 26 being Europeans, and for the first six months of 1936, fifteen positive, 12 Europeans. As regards Antananarivo cases the Europeans were all persons who had lived for some length of time on the coast but had acquired the infection in other colonies.

During 1935 the stools of 604 sharpshooters were examined, 367 Madagascans and 237 Senegalese. *S. mansoni* ova were found in 19 of the former (5 per cent.) and one of the latter; none had shown any clinical signs of disease. At Vatomandry 2,123 stools were examined and the ova were found in 759, or 35 per cent.; the percentage was lowest (15) in the cool season, highest (52–54) in the hot. In the province of Ambositra the probable intermediate host is *Planorbis madagascariensis*, which resembles in some respects *P. pfeifferi*.

H. H. S.

AWAKJAN (A.). Rats as Carriers of Dysenteric Entamoebae.—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 1. [In Russian pp. 23–24. English summary p. 24.]

———. Rats as Carriers of *Balantidium*.—*Ibid.* [In Russian pp. 25–26. English summary p. 26.]

In the first of these papers the author records the occurrence in 5 of 400 rats examined in Moscow of entamoebae having the characters

of *E. histolytica*. These were cultivated and were found to produce characteristic four-nuclear cysts. Injected *per rectum* in cats the amoebae proved to produce ulcerative colitis.

In the second paper it is noted that 8 of 27 rats caught in the elephant house of the zoological gardens harboured ciliates morphologically and culturally indistinguishable from *Balantidium coli* and *B. suis*. Faeces of infected rats and cultures injected rectally to rats and guineapigs produced infection in 8 of 12 experiments. The rat ciliate is named provisionally *Balantidium ratti*. Rats and guineapigs were experimentally infected with *B. coli* and rats with *B. suis*.

C. M. Wenyon.

CRAIG (Gladys M.). **A Modification of Cleveland's Medium for *Entamoeba histolytica*.**—*Arch. f. Protistenk.* 1936. Vol. 87. No. 2. pp. 296–298.

The short communication describes the improvement which is brought about in Cleveland's amoeba medium by diluting the human serum with sterile buffer mixture (1 in 10) before it is poured over the agar slopes. The actual agar is a mixture of Difco Bacto liver infusion agar 30.0 gm., dibasic sodium phosphate 3.0 gm., in distilled water 1.0 litre. This buffered medium with initial pH of 7.4 has constantly given heavy growth of *E. histolytica*.

C. M. W.

DESCHIENS (R.). Action comparée du sérum de lapin et du sérum de cheval sur les cultures de l'amibe dysentérique. [**Comparison of the Action of Rabbit and Horse Serum on Cultures of the Dysentery Amoeba.**]—*C. R. Soc. Biol.* 1936. Vol. 121. No. 4. pp. 327–329.

—. Action comparée du sérum de chat et du sérum de cheval sur les cultures de l'amibe dysentérique. [**Comparison of the Action of Cat and Horse Serum on Cultures of the Dysentery Amoeba.**]—*Ibid.* No. 19. pp. 409–411.

For the cultivation of dysentery amoebae rabbit serum medium gives a growth about twice as rich as horse serum medium. The richness of the growth depends, however, to some extent on the amoebae themselves and probably on the associated bacterial flora.

In the second paper it is noted that cat serum medium gives a growth 1.45 times as rich as horse serum medium. Of certain sera tried the relative merits are given by the following figures:—human 4.9, rabbit 2.04, cat 1.45, horse 1.

C. M. W.

DOPTER (Ch.) & DESCHIENS (R.). Action comparée du sérum humain normal et du sérum de dysentérique ambien sur l'amibe dysentérique en culture. [**Action of Normal Human Serum compared with that of Serum from Amoebic Dysentery Cases on the Dysentery Amoeba in Culture.**]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 28. pp. 355–358.

The authors have already shown that if the liquid portion of the medium (which covers the coagulated horse serum slope), consisting usually of horse serum diluted with Ringer's solution, be made of human serum, the dysenteric amoebae will grow about five times more luxuriantly. In the present paper they describe experiments in

which normal human serum is compared in this respect with serum from cases of *Entamoeba histolytica* infection. The result has been to show that normal serum gives on an average 2.57 times the growth given by the serum of the cases. For an explanation of the inhibiting effect of the serum of the amoebic cases further research is required.

C. M. W.

BIRCH-HIRSCHFELD (Luise). Die Bedeutung physikalischer Bedingungen bei der Kultur der *Entamoeba histolytica*. [Importance of Physical Conditions in the Culture of *E. histolytica*.]—*Ztschr. f. Hyg. u. Infektionskr.* 1936. May 14. Vol. 118. No. 3. pp. 361–368. With 13 figs.

By the use of cover glass cultures of *Entamoeba histolytica* it has been possible to observe the influence of various factors on the amoebae. The amoebae in liquid culture medium are placed between a slide and cover glass, the latter supported by wax feet. The height of the cover glass is such that fluid can be passed through the culture without the amoebae being dislodged or washed away. It was found the amoebae would tolerate an osmotic pressure of from 1.4 to 0.4 times that of normal Ringer solution. Amoebae exposed to pH of 2.9 or pH 9 for several hours were still capable of recovery. Though the amoebae could survive very low oxygen pressure, they reproduced well in an atmosphere of air, the growth being greatest at the edges of the cover glass. The surface tension of the amoebae is very low, hence the susceptibility of the surface to changes in medium and the death of many cells when subcultures are made. In the cover glass cultures the behaviour of the amoebae towards red blood corpuscles and the stages of ingestion of these can be conveniently studied. C. M. W.

CRAIG (Gladys M.). Relation of Hydrogen Ion Concentration to Growth and Encystment of *Entamoeba histolytica* in Cultures.—*Amer. Jl. Hyg.* 1936. Jan. Vol. 23. No. 1. pp. 114–121. [12 refs.]

The paper describes a buffered medium (liver agar slope covered with buffered dilute human serum) in which *E. histolytica* grows more readily than in unbuffered media. An initial pH of 7.4–7.6 was found to be most favourable. C. M. W.

• DESCHIENS (R.) & FLYE SAINTE-MARIE (P. E.). Comportement des cultures de l'amibe dysentérique en présence de certaines eaux d'égout. [Cultivation of Dysentery Amoebae in the Presence of Sewer Water.]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 24. pp. 1032–1034.

The authors have shown that certain sewer waters can replace Ringer's solution in the coagulated horse serum rice starch medium for the cultivation of dysentery amoebae. By suppression of the ingredients or the addition of others (cooked or powdered beef) they have reached the conclusion that under certain conditions the sewer waters of Fez at a temperature of 32° to 37°C. are suitable for the development and encystment of the amoebae. C. M. W.

- STONE (William S.). **A Method of producing Encystment in Cultures of *Entamoeba histolytica*.**—*Amer. Jl. Trop. Med.* 1935. Nov. Vol. 15. No. 6. pp. 681-684.
- . **Bacteria-free Antigen for the Complement-Fixation Test in Amebiasis. Preliminary Report of a New Method of Preparation.**—*Ibid.* pp. 685-687.

The method described consists essentially in transferring amoebae from a 48-hour-old culture of *E. histolytica* on Boeck-Drbohlav medium into a nutrient poor medium consisting of Locke's solution to which sterile whole wheat powder has been added. During the first 24-36 hours the introduced amoebae (from about three tubes of the original culture) will increase greatly in number, but after 48-72 hours practically all the amoebae will have encysted. A single culture will contain about 2,000,000 cysts. The cysts are normal in appearance and practically every one contains at first chromatoid bodies. These gradually disappear from the cysts, so that at the end of 14 days only an occasional cyst will be found with them. Cysts obtained in this manner have been stored in the ice-box for 4 months and have then excysted when introduced into fresh Boeck-Drbohlav medium.

In the second paper the author shows how the cysts in cultures made in the above manner may be washed and ground in alcohol to give a practically bacteria-free stable antigen which can be employed with satisfactory results for complement fixation tests. The reaction appears to be specific and does not give cross fixation with luetic and other sera. The serum of rabbits immunized by the intraperitoneal injection of four million washed live cysts gives a very clear-cut reaction with the antigen.

C. M. W.

- STONE (William S.). **A Method of eliminating *Blastocystis hominis* from Cultures of *Entamoeba histolytica*.**—*Jl. Lab. & Clin. Med.* 1935. Nov. Vol. 21. No. 2. pp. 190-191.

The technique described consists in adding to the supernatant fluid of a culture in Boeck-Drbohlav medium sufficient 1 in 10,000 neutral acriflavine in Ringer's solution to give a concentration of 1 in 50,000; after further incubation for 24 hours subculture is made and the process repeated. The amoebae are then inoculated into a medium in which the Ringer's fluid is replaced by a modified Locke's solution containing lactic acid. After several subcultures in this medium blastocystis will in most cases have entirely disappeared.

C. M. W.

- IVANIĆ (Momčilo). **Zur Kenntnis der Entwicklungsgeschichte von *Entamoeba histolytica* Schaudinn. [Development of *E. histolytica*.]**—*Zent. f. Bakt. I. Abt. Orig.* 1936. July 6. Vol. 137. No. 1/2. pp. 65-91. With 2 double plates. [24 refs.]

From a study of *E. histolytica* in a case of amoebic dysentery the author finds that the nuclear structure is very variable, that nuclear division may be promitotic or mitotic with or without the formation of chromosomes, which are six in number, and that resting stages occur which usually are seen with three nuclei. These nuclei have been evolved from the original amoebic nucleus by a complicated series of mitotic or promitotic divisions followed by degeneration of certain products of division. The three nuclei usually seen are destined to be

reduced to one by further nuclear degeneration. The whole process described and illustrated is exceedingly complicated and the reviewer feels that much more evidence than that produced by the author will be necessary before his views can be accepted. C. M. W.

DESCHIENS (R.). Perte de la virulence de deux souches d'amibes dysentériques en culture. [**Loss of Virulence of Two Strains of Dysentery Amoebae in Culture.**].—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 576-584. [14 refs.]

Two strains of dysentery amoebae which were pathogenic both to man and to the cat were found to have become non-pathogenic after culture for 90 to 170 days in one case and for 302-352 days in the other. The pathogenicity was tested on twenty animals by direct inoculation into the ileum through an abdominal incision according to the technique of Meleney and Frye. C. M. W.

DESCHIENS (R.). Modifications expérimentales du pouvoir pathogène de l'amibe dysentérique. [**Experimental Modifications of the Pathogenicity of the Dysentery Amoeba.**].—*C. R. Soc. Biol.* 1936. Vol. 123. No. 32. pp. 783-785.

Strains of *Entamoeba histolytica* which by long culture have lost much of their pathogenicity for kittens, as tested by inoculation of culture into the ileum after laparotomy, are liable to prove more pathogenic if bacteria from other and more virulent cultures or suspensions of killed typhoid or paratyphoid organisms are added to the inoculum. This result rather suggests that the flora associated with the amoebae are important in determining the pathogenicity. C. M. W.

MELENEY (Henry E.) & FRYE (William W.). **The Pathogenicity of *Endamoeba histolytica*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Jan. 25. Vol. 29. No. 4. pp. 369-379. [25 refs.]

By adopting a uniform method of culture of *E. histolytica* and technique of inoculation into a standard number of kittens the authors have tested the pathogenicity of various strains of dysentery amoebae. The conclusion is that variations in the clinical picture appear to depend first on the resistance of the hosts and secondly on the pathogenic activity of different strains of the amoeba. It has not seemed that prolonged cultivation has decreased the pathogenicity of any strain. It has not been found possible to raise the pathogenicity of any strain. A strain of *E. histolytica* in any population group appears to remain fairly constant as regards pathogenicity provided there is little chance of introduction of fresh strains into the group from without. In medical practice any strain should be regarded as dangerous. C. M. W.

FRYE (William W.) & MELENEY (Henry E.). **The Effect of Various Suspending Media on the Pathogenic and Phagocytic Activity of *Endamoeba histolytica*.**—*Amer. J. Hyg.* 1936. Sept. Vol. 24. No. 2. pp. 414-422.

In a previous communication the authors reported that the pathogenicity of *E. histolytica* for kittens appeared to be reduced if the

amoebae, before inoculation, were washed free of the bacteria which accompany them in the cultures and then suspended in horse serum-Ringer (1:6). It was thought that the result was probably due to the removal of the bacteria. A series of experiments here reported show that the horse serum was the cause and not the removal of the bacteria. Ringer's solution alone, without horse serum, has no such effect, while Ringer with boiled horse serum appeared to increase the pathogenicity of the amoebae as also did the filtered and boiled fluid from an amoeba culture in which, furthermore, the *in vitro* phagocytosis of red blood cells by the amoebae was most marked. C. M. W.

TER-MATEVOSSIAN (S.), SARKISSIAN (M.) & ZATURIAN (A.). [The Pathogenicity to Kittens of Strains of *Entamoeba histolytica* occurring in Armenia.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 1. [In Russian pp. 108-118.]

The authors tested the virulence for kittens of four strains of *Entamoeba histolytica* isolated in culture from cases of distinct forms of amoebiasis in Armenia: one of acute dysentery; another of untreated chronic amoebiasis; the third of a chronic case treated with emetine, and the fourth from a symptomless carrier.

Altogether fifty-two kittens were inoculated with cultures *per rectum* and their faeces were examined daily. All the strains of amoebae used proved to be pathogenic to kittens in various degrees, the one isolated from the acute case being most virulent, those from the chronic cases less so, and the one from the "carrier" case the least.

C. A. Hoare.

ZATURJAN (A.). Ueber nicht pathogene histolytica-ähnliche Amöben. [Non-pathogenic histolytica-like Amoebae.]—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 1. [In Russian pp. 60-65. With 12 figs. German summary p. 66.]

During the study of strains of *E. histolytica* in Armenia an amoeba was seen which reached a diameter of 17 microns and produced cysts 7-14 microns in diameter and characterized by the presence of numerous chromatoid bodies and a single nucleus. The amoeba was cultivated but did not produce cysts in culture. It was not possible to infect kittens. It is thought that a new species of *Entamoeba* may be represented, but further cases of the infection are being looked for.

C. M. W.

BONNIN (H.) & COURDURIER. La culture d'*Entamoeba histolytica* et ses applications cliniques. [Culture of *E. histolytica* and its Clinical Applications.]—Reprinted from *Maroc-Méd.* 1936. June 15. No. 168. 31 pp. [5 pages of refs.]

— & —. La culture d'*Entamoeba dysenteriae* et ses applications cliniques.—Abridged version of above: Reprinted from *Gaz. Méd. de France.* 1936. Vol. 43. No. 14. 18 pp.

In these articles the authors review the development of the cultivation of *Entamoeba histolytica* since this was first satisfactorily carried out by BOECK and DRBOHLAV in 1924. The media which have been employed

and the uses to which the cultures have been put are fully discussed and it is concluded that the culture methods are still hardly applicable to the routine laboratory diagnosis of amoebic infections. The use of amoebae from cultures for preparation of antigens for complement fixation tests is still in the experimental stage, while the culture methods have not yet settled the question as to whether there are pathogenic and non-pathogenic races of *E. histolytica*.
C. M. W.

CRAIG (Charles F.). **Some Unsolved Problems in the Parasitology of Amebiasis.**—*Jl. Parasitology*. 1936. Feb. Vol. 22. No. 1. pp. 1-13. [51 refs.]

In this paper, the address of the retiring president of the American Society of Parasitologists, the author discusses the possibility of the existence of a completely non-pathogenic race of *E. histolytica* (*E. dispar* of Brumpt), the question of the existence of races of *E. histolytica* of varying virulence and the subject of immunity after amoebic infections. The answer to the first question is not known, that to the second in the affirmative, while that to the third cannot be given, as the evidence is insufficient in spite of the knowledge that specific complement-fixing bodies occur in the blood of animals and individuals infected with *E. histolytica*.
C. M. W.

SPECTOR (Bertha Kaplan). **Significance of the Small Variety *Endameba histolytica*.**—*Amer. Jl. Public Health*. 1936. Aug. Vol. 26. No. 8. pp. 813-818. With 1 fig. [12 refs.]

In the summer of 1933, when the Chicago epidemic of amoebic dysentery started, the race of *E. histolytica* producing small cysts (5 μ or less up to 12 μ) was not encountered. It first appeared in December 1933 and soon assumed a prominent rôle, reaching its height in June 1934 and then declining till December 1934. It increased in frequency during January, February and March 1935, and has declined steadily since then, so that at the time of writing it was difficult to get a heavily infected specimen. A series of experiments designed to compare the small race with the ordinary one was arranged. It was found that the small race was more difficult to cultivate but that in the culture the amoebae were either small or larger, reaching the size of the amoebae in cultures of the large race. With antigen prepared from the large race amoebae the serum of cases infected with the small race could not be shown to contain complement fixing substances, whereas the serum of cases infected with the large race gave strongly positive reactions. With cysts of the small race administered by the mouth 8 of 37 kittens became infected, while 10 of 22 became infected when cysts of the large race were used. The large race given *per rectum* resulted in typical severe amoebic infection in kittens, while similar inoculations of the small race failed to produce results. Clinically in human beings the small race produces milder symptoms than the large race, rectal ulceration, pus, gross blood or evidence of organic involvement of the colon, and liver abscess being absent. Though the small race differs from the large race in these characters it is regarded merely as a race of *E. histolytica* and not as a distinct species.
C. M. W.

BIRCH-HIRSCHFELD (Luise). Ueber die Wirkung niederer Carbon-säuren und ihrer α -Oxyderivate auf *Entamoeba histolytica*. [**Action of Lower Fatty Acids and their α -Hydroxy Derivatives on *E. histolytica*.**—*Ztschr. f. Hyg. u. Infektionskr.* 1936. Nov. 14. Vol. 119. No. 1. pp. 91–102. With 6 figs.

By the use of microculture methods for observing the growth and movements of *E. histolytica* the author has been able to expose the amoebae to the action of organic acids and has noted that under certain conditions of pH and concentration definite cytoplasmic and nuclear degenerative changes are brought about. C. M. W.

FRYE (William W.) & MELENEY (Henry E.). **The Viability of *Entamoeba histolytica* Cysts after Passage through the Cockroach.**—*Jl. Parasitology.* 1936. Apr. Vol. 22. No. 2. pp. 221–222.

It is shown that cysts of *Entamoeba histolytica* will survive in and pass through the intestine of cockroaches. Cultures were obtained from the droppings of cockroaches passed 48 hours after feeding on cyst-containing faeces. C. M. W.

DEYOUNG (Willard). **Sources of Error in the Laboratory Diagnosis of Amebiasis.**—*Jl. Lab. & Clin. Med.* 1936. Aug. Vol. 21. No. 11. pp. 1149–1154. [12 refs.]

The value of the culture method as a means of diagnosis of *Entamoeba histolytica* infection was examined. It has been found that in culture *E. histolytica* and *E. coli* may come to resemble one another so closely that their differentiation in the time in which a diagnosis has to be made may be quite impossible. The culture method for diagnostic purposes may then be misleading. Reliance has to be placed on examination of fresh and fixed faecal specimens which will give an accurate diagnosis only when typical free or encysted *E. histolytica* are present. Faeces obtained after the ingestion of oil, bismuth or arsenic or by means of a saline purge are liable to lead to errors.

C. M. W.

BRUG (S. L.). Die Eosinmethode bei der Stuhluntersuchung auf Protozoen. [**The Eosin Method of Stool Examination for Protozoa.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 522–523.

The author writes in favour of the eosin method of stool examination for intestinal protozoa and their cysts, as first introduced in 1913 by KUENEN and SWELLENGREBEL. The preparation is made by mixing the faeces with a 2 per cent. eosin solution. The unstained living protozoa and their cysts stand out clearly against the rose-coloured background and are thus more easily seen than in the ordinary saline or iodine preparations. C. M. W.

ANDREWS (Justin) & WHITE (Harry F.). **An Epidemiological Study of Protozoa Parasitic in Wild Rats in Baltimore, with Special Reference to *Entamoeba histolytica*.**—*Amer. Jl. Hyg.* 1936. July. Vol. 24. No. 1. pp. 184–206. With 2 figs. [56 refs.]

The paper has to do with the results of a survey of rats for protozoan parasites carried out in Baltimore from October 3, 1934 to October 11,

1935. More than 2,500 Norway rats received alive were examined for intestinal blood-inhabiting and other protozoa. The organisms found were *Entamoeba histolytica*, *E. muris*, *Trichomonas muris*, *T. parva*, *Chilomastix bettencourti*, *Retortamonas* (*Embadomonas*), *Giardia muris*, *Eimeria miyairii*, *E. carinii*, *E. separata*, *Balantidium coli*, *Hexamita muris*, *Endolimax nana*, *Trypanosoma lewisi*, *Hepatozoon muris* and *Sarcocystis* sp. Certain of these, *T. parva*, *T. lewisi* and the coccidia, were more common in young than in adult rats. *Sarcocystis* was exclusively a parasite of adults. The maximum incidence of coccidia was in the spring, of *T. lewisi* in the summer and of *T. parva* in the summer and autumn. Infection with *E. histolytica* was found in 28 rats.

C. M. W.

BARBAGALLO (Bonaventura). La prova di Weltmann nelle coliti amebiche e non amebiche. [**Weltmann Test in Amoebic and Non-amoebic Colitis.**—*Riforma Med.* 1936. May 30. Vol. 52. No. 22. pp. 743-745. [10 refs.]]

The author has applied the Weltmann test, which is, in brief, the degree of coagulation brought about by heat on various dilutions of serum, to the sera of cases of amoebic and non-amoebic colitis. The finding is that in all conditions of colitis there is an increase in the coagulation band.

C. M. W.

SHIRAOGAWA (H.). Immunologische Studie ueber die Dysenterieamöbe. [**Immunological Studies on the Dysentery Amoeba.**—*Fukuoka Acta Med.* (*Fukuoka-Ikwadaigaku-Zasshi*). 1935. Nov. Vol. 28. No. 11. [In Japanese pp. 2635-2672. [38 refs.]; 2673-2729. With 1 chart & 65 figs. on 2 plates. [28 refs.]; 2730-2760. [17 refs.] German summary pp. 113-115.]]

By alcoholic abstract of culture amoebae the author has obtained haemolytic substances which in the case of the *E. histolytica* extract were active in a dilution of 1:640, the *E. coli* extract being much weaker. Rabbits injected with these extracts developed immune substances which for complement fixation, precipitin and amoebalytic reactions were specific for the homologous amoebae. In a series of 23 amoebic cases similar immune bodies were demonstrated in the sera.

C. M. W.

CRAIG (Charles F.). **The Diagnostic Value of the Complement Fixation Test in Amebiasis.**—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 305-314. [17 refs.]

In an earlier paper the author (1933) reviewed the results he had obtained with the test in 1,000 individuals and considered its diagnostic value. In the present paper it is stated that the tests since carried out have not materially differed from those previously reported. The conclusions reached are similar to those in the 1933 paper, to the review of which readers are referred (this *Bulletin*, 1933, Vol. 30, p. 760).

C. M. W.

ATCHLEY (Floyd O.). **Experimental Infections of Rats with *Endamoeba histolytica*.**—*Amer. Jl. Hyg.* 1936. Mar. Vol. 23. No. 2. pp. 410-414. [13 refs.]

With *E. histolytica* strains from wild rats and from man laboratory rats have been inoculated *per os*. With the rat strain 8 out of 17 animals became infected, whereas with the human strain only 4 out of 30 experiments succeeded. Cysts were observed in only one animal which a month before had received the human strain by the mouth. The infections in both the naturally infected and experimentally infected rats produced no intestinal change. Of 6 kittens inoculated with a wild rat strain two became positive, though it was not possible to demonstrate invasion of the tissues. C. M. W.

ALEXEIEFF (A.). Sur le métabolisme du glycogène chez les trichomonas et les entamibes. [**Metabolism of the Glycogen in the Trichomonads and Entamoebas.**]—*Bull. Soc. Path. Exot.* 1936. Feb. 12. Vol. 29. No. 2. pp. 116-118.

During the growing phase of certain species of *Trichomonas* glycogen accumulates in the cytoplasm, especially in the neighbourhood of the axostyle. When division is taking place, during which the axostyle is absorbed, the glycogen is used up so that by the time division is complete this substance can no longer be detected.

In the case of *Entamoeba histolytica* glycogen is distributed throughout the cytoplasm of the trophozoites. When encystment occurs the glycogen is concentrated into one mass to form the well-known glycogenic vacuole. In *E. coli*, on the other hand, glycogen is not present in the cytoplasm. C. M. W.

SPECTOR (Bertha Kaplan). **Self-Inoculation with *Endamoeba histolytica* Trophozoites through Vaseline and the Longevity of the Trophozoites in Vaseline.**—*Amer. Jl. Trop. Med.* 1935. Nov. Vol. 15. No. 6. pp. 689-691.

The patient appears to have contracted amoebic infection by applying to the anus, for relief of constipation, vaseline from a jar which was used by an undoubted amoebic case to allay the anal irritation of persistent diarrhoea. It was shown subsequently that dysentery amoebae in blood and mucus smeared on vaseline will remain alive for over nine hours at laboratory temperature. C. M. W.

GERMAIN (A.), CARBONI (P.) & MORVAN (A.). Hémorragies intestinales intermittentes, seul signe d'amibiase chronique latente. [**Intermittent Intestinal Haemorrhage in Chronic Latent Amoebiasis.**]—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 673-677.

The case of a soldier, 27 years of age, 11 years' service in South America, the coast of Africa, and Indo-China. In the course of less than two years, June 1934-February 1936, he had three attacks of haemorrhage from the bowel, in June 1934, July 1935, and February 1936, fairly profuse up to 300 gm. at a time, and smaller bleedings in January 1935 on and off for a fortnight. The only other symptom present was pain to the right of the umbilicus. Examination of the faeces revealed cysts of *E. histolytica* and by sigmoidoscope ulcers in

the sigmoid. There were no internal haemorrhoids, or polypi. A course of emetine followed by stovarsol resulted in disappearance of the cysts and healing of the ulcers. No other cause could be found for the bleeding. No history of any dysenteric attack could be obtained.

H. H. S.

BANERJI (L. M.), CHOPRA (R. N.) & RAY (P. N.). **Amoebiasis and Appendicitis.**—*Indian Med. Gaz.* 1936. Dec. Vol. 71. No. 12. pp. 693–699. With 7 figs. on 3 plates. [15 refs.]

The incidence of appendicitis as a complication in amoebic dysentery has been noted by several observers. Thus, STRONG, in a series of 100 fatal cases of this form of dysentery found it in 7, CLARK, H. C. (*Amer. Jl. Trop. Med.* 1925, Vol. 5, p. 157) found amoebic ulcerative appendicitis in 76 out of 186 (40.8 per cent.) autopsies on cases of amoebic dysentery and 9.2 per cent. of these had resulted in perforation or abscess, and CRAIG in 1934 from analysis of 60 cases of amoebic dysentery found 16 (26.6 per cent.) with appendicitis.

The authors have studied the large number of 475 cases of appendicectomy and find in 5 per cent. an association with amoebiasis, and nearly half the patients gave a history of dysentery within the preceding year. In a series of 25 cases in which no emetine had been given cysts of *E. histolytica* were found in scrapings from the appendical mucosa. Sigmoidoscopy was a valuable diagnostic aid; in 11 out of 28 consecutive cases cysts were found in the stools and the entamoeba was found in scrapings of three. Inflammation of the submucous layers with some degree of fibrosis of the appendix was seen, but rarely the typical amoebic ulceration, probably because in most cases emetine has been given prior to the operation. In a later paper the radiological study of cases is to be dealt with.

H. H. S.

GREPPI (E.) & DELEONARDI (S.). Anemia ipocromica achilica in amebiasi intestinale cronica.—Reprinted from *Boll. d. Soc. Med.-Chirurg. Catania*. 1935. Feb. 21. Vol. 3. No. 2. pp. 110–126. With 2 figs.

GOLDBURGH (Harold L.). **Amebic Abscess of the Liver : Report of a Case without Previous Manifestations of Amebiasis : Operation and Recovery.**—*Trans. College of Physicians of Philadelphia*. 1936. 4th Ser. Vol. 4. No. 1. pp. 46–47.

The case recorded is that of a man of 58 who was operated upon for a condition indicating acute gall bladder syndrome with probable liver complications. A solitary right lobe liver abscess, from which ten ounces of brownish pus were evacuated, was discovered. In the pus *Entamoeba histolytica* was found. Ten stool examinations failed to reveal either free or encysted amoebae, though the X-ray of the colon did show chronic inflammatory lesions at the caecum and ascending colon. The case, which gave no history of previous dysentery, illustrates the fact that the first symptoms of amoebiasis may be those of amoebic abscess of the liver.

C. M. W.

MÜHLENS (P.). Amöbenruhr und Ruhrfolgen.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 245–250.

FISCHER (O.). Amöbenruhr und Ruhrfolgen.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 251–256. With 4 figs.

WENRICH (D. H.). *Studies on Dientamoeba fragilis* (Protozoa). I. **Observations with Special Reference to Nuclear Structure.**—*Jl. Parasitology*. 1936. Feb. Vol. 22. No. 1. pp. 76–83. With 25 figs. [12 refs.]

The author notes that infections with *Dientamoeba fragilis* are of more common occurrence and that the amoeba itself is capable of persistence in faeces for a longer time than is usually supposed. The nucleus contains four or more granules and it is suggested that when the number is eight this results from division of an original four granules or the fusion of two nuclei each with four granules. In the nucleus one granule larger than the others probably represents a karyosome. No true cysts have been identified, though certain individuals suggest precystic forms. C. M. W.

BRUG (S. L.). *Dientamoeba fragilis*.—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. May 26. Vol. 76. No. 21. pp. 1288–1302. With 2 charts & 1 plate. English summary.

The intestinal protozoa of 80 inmates of an asylum in Amsterdam were investigated. All the usual forms were found but the high incidence of infection with *Dientamoeba fragilis* is noteworthy. This amoeba was demonstrated in 10 cases by direct examination of faeces and in 19 others by culture methods. It is pointed out that it is not as fragile as its name implies, a culture having been obtained from a 13½-hour-old stool. Nuclear division is described, as also the occurrence in cultures of what may be precystic forms. To obtain subcultures it was necessary to inoculate tubes with material from another tube containing at least 100 amoebae per cc. Even then there was a lag phase or marked diminution of amoebae during the first day. C. M. W.

HAKANSSON (E. G.). *Dientamoeba fragilis*, a Cause of Illness. **Report of Case.**—*Amer. Jl. Trop. Med.* 1936. Mar. Vol. 16. No. 2. pp. 175–185. With 16 figs. on 1 plate.

The case described is that of a physician in Panama who suffered from acute colitic irritation with diarrhoea of 14 days' duration. During this time the symptoms, which gave rise to a general feeling of illness, became very severe in character on three occasions, on each of which very large numbers of *Dientamoeba fragilis* occurred in the stools. Though the amoebae were present between the attacks they were scanty and much smaller than when they appeared to be in a condition of active cultivation in the intestine. On the 14th day carbarsone treatment (0.25 gm. 3 times a day) was commenced. On the following day there was marked improvement and no amoebae could be found. Recovery was uninterrupted, so that treatment was discontinued on the third day. The stools were examined daily for two weeks and then twice a week for 5 months without the discovery of any amoebae. There has been no recurrence of symptoms. The conclusion is that it does not seem possible that *D. fragilis* played its reputed rôle of a harmless commensal during this illness. No other protozoa were found. It is noted that though the name *fragilis* suggests a fragile amoeba, actually it is able to persist alive in stools up to 48 hours after evacuation. It is pointed out that if the living amoeba is examined in water the toughness and resistancy of the

ectoplasm causes it to rupture and evacuate its endoplasm through the ectoplasm in a manner so characteristic that this feature may be used for identification purposes.

C. M. W.

GUPTA (B. M. Das). **A Case of Human Infection with *Dientamoeba fragilis* Jepps and Dobell, 1918, in Calcutta.**—*Indian Med. Gaz.* 1936. Sept. Vol. 71. No. 9. pp. 528–529. With 5 figs.

The case described is the first one to be reported from Calcutta. Some of the amoebae were remarkable for their size, reaching 16.5 microns in diameter.

C. M. W.

GIROLAMI (Mario). L'amebiasi urinaria. Rivista critico-sintetica con contributo clinico e sperimentale. [**Urinary Amoebiasis.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Mar. & Apr. Vol. 17. Nos. 3 & 4. pp. 129–176; 228–246. With 6 figs. [3 pages of refs.]

This is a long article, written in a critical style, reviewing the literature of so-called urinary amoebiasis and recording certain new observations on this condition. It is concluded that the claims of PENSO that a particular species of amoeba, *Entamoeba vesicalis*, occurs in human urine and is definitely pathogenic are well founded and that both it and *Entamoeba histolytica* may be the cause of cystitis and other diseases of the urinary tract. It is claimed that both occur in urine in the free and encysted stage, but it would seem from the description and illustrations of the encysted forms that there has been no clear appreciation on the part of the author as to what constitutes an encysted stage. The reviewer cannot avoid the impression that no reliance can be placed on the observations recorded.

C. M. W.

BACHRACH (Robert). Ueber Amöben-Infektion der Harnwege. [**Amoebic Infection of the Urinary Tract.**]—*Wien. Klin. Woch.* 1936. Sept. 11. Vol. 49. No. 37/38. pp. 1123–1125. With 2 figs.

A patient who developed haematuria four years after suffering from amoebic dysentery was found to be suffering from gonorrhoea and papilloma of the bladder. In the urinary sediment amongst numerous red blood corpuscles, leucocytes and other cells were seen certain large vacuolated cells (25–50 microns) with included red blood corpuscles and other material. In sections of the incised papilloma large cells having an average diameter of 30 microns were occasionally seen. It is concluded that these cells are amoebae but to the reviewer the evidence of their amoebic nature is not entirely satisfactory.

C. M. W.

MANOHAR (K. D.). **A Case of Urinary Amoebiasis. Review of the Literature.** [*Memoranda.*]—*Brit. Med. J.* 1936. Apr. 4. pp. 694–695. [10 refs.]

The discovery in the urine of a woman on four occasions during the course of two weeks of large sluggishly motile cells with occasional included red blood corpuscles led to the diagnosis of urinary amoebiasis. No amoebae were found in the faeces. The motile cells in the urine formed ectoplasmic pseudopodia and had nuclei of the entamoeba type.

It does not seem possible to be certain from this account that the cells were amoebae and not macrophages. C. M. W.

CARINI (A.). Un cas d'amibiase cutanée. Considérations sur les localisations extra-intestinales de l'amibiase et spécialement sur l'amibiase cutanée. [**Case of Cutaneous Amoebiasis. Considerations on the Extra-Intestinal Localizations of Amoebiasis and Especially on Cutaneous Amoebiasis.**—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 584-596. With 5 figs. [15 refs.]

The case recorded is that of a man who suffered from amoebic dysentery and developed a peri-anal ulcerative condition due to invasion of the skin by the amoebae. The skin condition appeared to commence after the appearance of perineal furuncles which presumably gave a passage into the skin for the amoebae. When the condition had been diagnosed by the discovery of amoebae in the tissues a rapid cure was effected by emetin injections and quinine applications locally.

C. M. W.

JOSLYN (Harold L.). **Effective Method of treating Amebic Abscess of the Liver.**—*Jl. Amer. Med. Assoc.* 1936. Dec. 26. Vol. 107. No. 26. pp. 2117-2119.

If, as the author states, the idea of treating amoebic abscess of the liver by aspiration and emetine injections is little known in most parts of the United States, then it is high time that the knowledge was made more widely accessible and the author has done well to publish details of his two cases. It is more than a quarter of a century ago that Sir Leonard ROGERS reported several cases successfully treated by aspiration, and 14 or 15 years since he showed the greater success from aspiration *plus* emetine injections.

H. H. S.

GIOVANNI (Magliano). Amebiasi, ascesso epatico ed emetinoterapia. [**Liver Abscess treated with Emetine.**—*Ann. di Med. Nav. e Colon.* 1936. Nov.-Dec. 42nd Year. Vol. 2. No. 5-6. pp. 237-240. With 2 charts & 1 fig.

The patient presented symptoms of abscess of the liver and was treated by emetine intramuscularly and recovered. The diagnosis was based on the results of treatment. Examination of the stools did not result in the finding of *E. histolytica* and the liver was not explored.

H. H. S.

PECKOLT (Waldemar) & PRADO (Alcides). Contribuição á materia medica vegetal do Brasil. VI. Estudo pharmacognostico e terapeutico da *Jacaranda decurrens* Cham. (*Bignoniaceae*). [**Vegetable Materia Medica of Brazil. VI. Pharmacognosy and Therapeutics of *Jacaranda decurrens* Cham.**—*Mem. Inst. Butantan.* 1935. Vol. 9. pp. 301-318. With 3 figs. English summary (9 lines).

It is claimed that the administration of tincture of *Jacaranda decurrens* will rid the intestine of all the intestinal protozoa, including *E. histolytica*.

C. M. W.

BOURROUL (Celestino). Tratamento das amebioses. [Treatment of Amoebiasis.]—*Folha Med.* 1936. Aug. 5. Vol. 17. No. 22. pp. 373-375.

This gives a list, with doses, of a large number of remedies which have been employed for the treatment of amoebiasis. C. M. W.

MAJUMDAR (Akhil Ranjan). Difficulties in the Treatment of Amoebiasis.—*Jl. Indian Med. Assoc.* 1936. Sept. Vol. 5. No. 12. pp. 746-752. [66 refs.]

KNAUFF (Günther). Studien ueber *Balantidium coli*. [Studies on *Bal. coli*.]—*Ztschr. f. Parasitenk.* 1935. Dec. 13. Vol. 8. No. 2. pp. 139-182. With 11 figs. [70 refs.]

The paper is a record of observations carried out on *Balantidium* in pigs, and culture experiments with the ciliate, which is compared with the forms recorded from man, monkeys, sheep and other animals.

C. M. W.

RACHMANOW (H.) Die Bestimmung des spezifischen Gewichts der Zysten von *Lambliia intestinalis* (*Giardia intestinalis*). [Determination of the Specific Gravity of Cysts of *Lambliia intestinalis* (*Giardia intestinalis*).]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 395-396.

The testing of lamblia cysts with fluids of varying specific gravity has shown that they correspond to a 30 per cent. sugar solution and have thus a specific gravity of approximately of 1.1133. A three months old child was passing daily 300 to 900 million cysts. C. M. W.

MORENAS (L.). Les aspects cliniques de la lambliose en France. [Clinical Aspects of Lamblasis in France.]—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May-June. Vol. 2. No. 3. pp. 445-453. English summary.

The frequency with which the flagellate lamblia is discovered in the faeces of cases of diarrhoea, especially in children, or in the material obtained by duodenal tubage is being interpreted by clinicians as evidence of its pathogenicity. A definite disease condition, lamblasis, is being visualized and various types of the infection are described—enteritic, biliary, cachectic and healthy carrier. This article sets forth this clinical point of view and discusses in some detail the symptomatology of the various types of infection. The erroneous assumption is made, as is so often the case, that the presence of flagellates in material obtained by duodenal tubage is evidence of their actual presence in the gall bladder. C. M. W.

SIMICI (D.), POPESCU (M.) & COVACEANU (C.). Recherches faites en Roumanie sur la fréquence de l'infection du duodénum et des voies biliaires par les lamblis intestinalis. [Researches made in Rumania on the Frequency of *Lambliia* Infection of the Duodenum and Biliary Tracts.]—*Bull. et Mém. Soc. Méd. Hôpit. de Bucarest.* 1935. Nov. Vol. 17. No. 9. pp. 154-160.

By various methods of obtaining fluid from the duodenum and stimulating flow of bile from the bile duct the authors come to the conclusion

that *Giardia intestinalis* actually may inhabit the bile duct or gall bladder. The evidence is that the later withdrawn fluid may contain more organisms than the first. However suggestive such evidence may be, it has to be remembered that the flagellate lives within the lumen of the duodenal glands and on the surface of the duodenal epithelium, so that it seems not improbable that the flagellates seen in duodenal fluid have come from these localities and not from the bile duct. A few well authenticated cases of discovery of flagellates in the gall bladder at surgical operations, or even at post-mortem examinations, by trustworthy observers who know how to carry out such investigations would settle the much disputed question. C. M. W.

POZZI (A.) & DE MURO (P.). Sulla giardiasi duodenale. [**Duodenal Giardiasis.**]—*Policlínico*. Sez. Prat. 1935. Dec. 2. Vol. 42. No. 48. pp. 2359-2362, 2365-2368. [42 refs.]

The paper describes three cases of *Giardia intestinalis* infection and the symptoms associated with this. A cure was obtained by duodenal irrigation with 0.4 per cent. hydrochloric acid solution and oral administration of magnesium sulphate on alternate days. C. M. W.

NUNAN (Berardo). Giardiose intestinal na criança. [**Intestinal Giardiasis in Children.**]—*Brasil-Médico*. 1936. May 2. Vol. 50. No. 18. pp. 379-383. [14 refs.]

A general account of the condition which is being termed "giardia enteritis" in children. C. M. W.

ENAUULT. Un cas de colite à lamblia chez un malade ne tolérant pas l'arsenic; traitement créno-médicamenteux; résultat.—*Marseille-Méd.* 1936. Mar. 15. Vol. 73. No. 8. pp. 329-332.

GONZÁLEZ (Gustavo). Flagelosis intestinales. [**Intestinal Flagellate Infections.**]—*Rev. Med.-Cirurg. do Brasil*. 1935. Oct. Vol. 43. No. 10. pp. 693-700.

A discussion of various symptoms and groups of symptoms which are attributed by the author to infections with *Giardia*, *Chilomastix* or *Trichomonas*. C. M. W.

YELLOW FEVER.

- i. JAMES (S. P.) Renseignements sur la fièvre jaune reçus au cours des six mois finissant le 31 mars 1936. [**Information on Yellow Fever received during the Course of the Six Months ending 31st March, 1936.**—*Bull. Office Internat. d'Hyg. Publique.* 1936. July. Vol. 28. No. 7. pp. 1267-1277. With 1 folding map. [12 refs.]
- ii. SOREL. Les cas de fièvre jaune dans les colonies françaises en 1935. [**Yellow Fever Cases in French Colonies in 1935.**—*Ibid.* pp. 1278-1291. With 1 diagram & 1 map.
- iii. PRIDIE (E. D.). Faits récents concernant la fièvre jaune dans le Soudan Anglo-Egyptien, en particulier la lutte contre les moustiques. [**Recent Facts concerning Yellow Fever in the Anglo-Egyptian Sudan, especially Anti-Mosquito Measures.**—*Ibid.* pp. 1292-1297. With 2 maps (1 folding).
- iv. MEJIA (Hernández). Le test de protection et l'épidémiologie de la fièvre jaune au Mexique. [**The Protection Test and the Epidemiology of Yellow Fever in Mexico.**—*Ibid.* pp. 1298-1308.
- v. BOYÉ. Séro-vaccinations anti-amariles et recherches concernant le test de protection en Afrique Equatoriale Française. [**Serum Vaccination against Yellow Fever and Studies on the Protection Test in French Equatorial Africa.**—*Ibid.* pp. 1309-1312.
- vi. BABLET (J.). Deuxième note sur le diagnostic histologique de la fièvre jaune (examen des coupes de foie). [**A Second Note on the Histological Diagnosis of Yellow Fever. (Examination of Liver Sections.)**—*Ibid.* pp. 1313-1320.
- vii. FINDLAY (G. M.). La vaccination contre la fièvre jaune (1932-1936). [**Vaccination against Yellow Fever (1932-1936).**—*Ibid.* pp. 1321-1324. [15 refs.]
- viii. SOREL. La vaccination anti-amarile en Afrique Occidentale Française. Mise en application du procédé de vaccination Sellards-Laigret. [**Anti-Yellow Fever Vaccination in French West Africa. The Application of the Sellards-Laigret Method of Vaccination.**—*Ibid.* pp. 1325-1356.
- ix. STANTON (Thomas). Les insectes dans les aéroplanes au Kenya. [**Insects in Aeroplanes in Kenya.**—*Ibid.* pp. 1357-1360. [See this *Bulletin*, 1936, Vol. 33, p. 343.]
- x. BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1936. July. Vol. 28. No. 7. pp. 1361-1364.—Rapport de la commission de la fièvre jaune. (Session de mai 1936.) [**Report of the Yellow Fever Commission.**]

i. A useful summary of recent observations.

ii. During 1935 there were only 14 cases (all fatal) of yellow fever recorded from French West Africa, as compared with 23 the previous year; the Ivory Coast remains the Colony most affected. A map is given showing the distribution of these cases which extend from Senegal to Dahomey.

Details are given of the clinical symptoms and autopsies of five of these cases, and the difficulties of diagnosis are well illustrated. The author recommends the systematic examination of the liver of any individual who succumbs to a rapid fever, no matter what the symptoms. Moreover it is desirable to examine the medulla, in addition to pieces of liver and kidney, in order to detect any possible changes in the nature

of the yellow fever virus, such as the development of neurotropic affinities.

iii. Details are given of the distribution of *Aedes aegypti*, which is widely distributed throughout the Sudan, especially in the north and west where there are extensive epidemics of dengue. As a result of antimosquito measures they have now disappeared from Khartoum and Atbara, and almost so from Malakal, where only one breeding place was found out of 79,872 inspections. A suspected fatal case of yellow fever occurred at Malakal in January 1936, but the history and pathological changes were not sufficiently clear for a definite diagnosis to be made.

It is recommended that the principal aerodromes of the frontiers of the Sudan, Kassala, Geneina, Juba and Wadi Halfa, should be made "sanitary aerodromes," especially at Geneina.

Viscerotomy is now being practised in hospitals, and elsewhere when possible, on all undiagnosed fatal cases of fever dying in less than 9 days. Sera are being collected to see if anything comparable to jungle yellow fever occurs in the Sudan. Finally, each year the distribution of *Aedes aegypti* is being determined.

iv. The author gives an historical account of recent yellow fever epidemics in Mexico up to 1922, and then the results of protection tests with sera collected from children and adults in these areas. The results indicate that yellow fever has been absent since 1925, but it is considered advisable to make a more extended series of tests in order to be certain of its exact distribution. Moreover, antilarval measures against mosquitoes should be intensified in regions where they are particularly abundant.

v. Details are given of the results of serum vaccinations in 107 Europeans, performed by Dr. STEFANOPOULO. No reaction attributable to the virus was ever observed, but serum reactions occurred in 7 of the cases, consisting of urticaria and joint pains lasting for 2 or 3 days.

vi. A further account of the technique used in the histological examination of specimens of liver, including a useful discussion of the interpretation of the appearances presented by different infections. [See this *Bulletin*, 1936, Vol. 33, p. 334.]

vii. A summary of the results of the vaccination of 951 persons against yellow fever by mixtures of virus and immune serum. In view of the possible danger of using a neurotropic virus a pantropic strain has been used recently and none of the 190 persons vaccinated with this virus has shown any very serious reactions. The pantropic strain is preserved in tissue culture, using a similar technique to that described by LLOYD, THEILER and RICCI [see this *Bulletin*, 1936, Vol. 33, p. 623], but employing as tissue chick embryos instead of mouse embryos, in view of the danger of introducing spontaneous mouse virus with the latter.

viii. Up to the end of 1935 a total of 23,890 vaccinations had been made in the French Colonies of West Africa, and 5,699 persons received three inoculations, using attenuated mouse virus without serum. The author first gives a detailed examination of the prophylactic value of vaccination and shows that the proportion of vaccinated persons is not sufficiently large to furnish any conclusive evidence. With regard to the reactions produced in man by the living virus, in 1934, 35.2 per cent. were found to give a reaction after the first inoculation, 27.1 per cent. after the second and 6.3 per cent. after the third. In 1935, there were 22.8 per cent. after the first, 14.8 after the second and 10.7 after the third. These reactions were found to fall into two groups.

The first, in which the symptoms developed about the 6th to 8th day after vaccination, includes the great majority of the cases. There is nothing of special interest about these reactions although they may be severe, but the patients invariably recover. The second group includes a number of cases in which reactions of the nervous system develop about the 12th to 15th day after vaccination. These cases are much more serious and it is necessary to reserve judgment as to their future history. Also their aetiology is uncertain, as they may be due either to yellow fever virus, or to a spontaneous mouse virus. An account of the clinical history of 20 of these patients is given in detail.

The author considers that although strong evidence of the efficacy of this method of vaccination has been brought forward, nevertheless the method must still be regarded as under discussion. Moreover, one cannot say that it is innocuous, not only for the few days after inoculation, but also after several months. It is very necessary, therefore, to follow up the history of any vaccinated subjects under various conditions, and it seems prudent not to think of making any systematic generalization of a method which still requires further study.

E. Hindle.

- i. JAMES (S. P.). Renseignements sur la fièvre jaune reçus au cours des six mois finissant le 30 septembre 1936. [**Information on Yellow Fever received during the Course of the Six Months ending 30th September, 1936.**—*Bull. Office Internat. d'Hyg. Publique*. 1936. Dec. Vol. 28. No. 12. pp. 2329-2332.]
- ii. SAWYER (W. A.) & BAUER (J. H.). Résultats de l'enquête sur l'immunité amarile dans la région de la mer des Antilles. [**Results of an Inquiry into Yellow Fever Immunity in the Region of the Caribbean Sea.**—*Ibid.* pp. 2333-2335.]
- iii. VAN CAMPENHOUT (Em.). Considérations relatives à la fièvre jaune au Congo Belge (épidémiologie, prophylaxie) d'après les renseignements extraits des récents Rapports. [**Observations concerning Yellow Fever in the Belgian Congo (Epidemiology, Prophylaxis) with Reference to Information in Recent Reports.**—*Ibid.* pp. 2336-2339.]
- iv. KIRK (R.). Nouvelles recherches sur la fièvre jaune au Soudan Anglo-Egyptien. [**New Researches on Yellow Fever in the Anglo-Egyptian Sudan.**—*Ibid.* pp. 2340-2345.]
- v. BABLET (J.). Sur le diagnostic différentiel entre la spirochétose ictéro-hémorragique et la fièvre jaune par l'examen histologique du foie. [**The Differential Diagnosis between Weil's Disease and Yellow Fever by Histological Examination of the Liver.**—*Ibid.* pp. 2346-2352.]
- vi. THEILER (Max) & SMITH (H. H.). L'emploi du sérum hyperimmun de singe dans la vaccination humaine contre la fièvre jaune. [**The Use of Monkey Hyper-immune Serum in Human Vaccination against Yellow Fever.**—*Ibid.* pp. 2354-2357.]
- vii. BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1936. Dec. Vol. 28. No. 12. pp. 2358-2360.—Rapport de la commission de la fièvre jaune. (Session d'octobre 1936.) [**Report of the Yellow Fever Commission (October Session, 1936).**]

i. During the first 9 months of 1936, cases of yellow fever have occurred in Bolivia (16 cases), Brazil (179 cases) and Colombia (51 deaths, number of cases not stated). In Africa a total of 11 cases are

recorded from French West African Colonies, including Dahomey, Guinea, Ivory Coast, Niger Territory and Senegal, and 9 cases from British Colonies including the Sudan, Gold Coast and Nigeria.

Attention is called to the results of further mouse protection tests showing that the disease has been widespread in the Nuba mountains during the past 20 years, but clinically recognizable cases are rare. The examination of 76 monkeys from endemic areas showed that 15 contained specific antibodies against yellow fever, approximately the same percentage obtained by SOPER as a result of the examination of South American monkeys.

A Yellow Fever Research Institute has been established at Entebbe as a result of arrangements between the International Health Division of the Rockefeller Foundation and the Colonial Office in London.

In London 380 patients have now been vaccinated by the use of viscerotropic yellow fever virus attenuated by tissue culture, combined with hyper-immune serum, without any noticeable reactions.

ii. The authors have made mouse protection tests on 1,176 samples of serum collected from inhabitants of the islands of Barbados, Cuba, Jamaica, Porto Rico, St. Lucia and Trinidad. In addition specimens of serum from the mainland have also been examined including Mexico, Salvador, Guatemala, Honduras, British Honduras, Costa Rica and Nicaragua. With reference to the samples from the islands, 823 from subjects under 20 years old were all negative, an indication that the disease has not existed in these islands during the lives of the donors, but of the remaining 353 samples, 30 gave a positive protection test, the youngest of these being a Cuban aged 28 years.

The samples from the mainland, however, indicate that in Mexico the disease was very widespread previous to 1925, since when it has disappeared. Similar results were obtained in all the other countries examined with the exception of Costa Rica, where the disease seems to have been absent for the past twenty years.

iii. Attention is drawn to the fact that in the Lower Congo, the re-examination of the serum of natives giving a negative mouse-protective test in 1932 and 1933, has resulted in 6 per cent. now giving a positive test. Nevertheless, there has been no suspicion of the existence of yellow fever in this neighbourhood.

In the region of Libenge there has recently been an epidemic of infective jaundice. In 1933, before this epidemic, the examination of sera at one locality gave adults 12 per cent. positive, children all negative, and at a second locality 6 per cent. positive for all ages. A subsequent examination of sera of natives of these areas who gave no history of jaundice showed 29 per cent. positive and 9.4 per cent. doubtful, whilst of those recovered from jaundice 46.6 per cent. were positive, and 13 per cent. doubtful.

The special interest of these cases is that both Weil's Disease and yellow fever were excluded as possible causes of this epidemic of infective jaundice.

iv. During the past 18 months since January 1935, 3 sera out of 23 cases of jaundice have given positive mouse-protective tests, one from Juba, one from Malakal and the other from Wad Medani. But since 10 to 50 per cent. of the population may be positive these results are of doubtful significance in determining the nature of the jaundice.

The examination of 36 livers from cases of fever of obscure origin, fatal within 9 days, has given uniformly negative results.

The sera of 15 *Cercopithecus* monkeys have been tested and one gave a positive protection test. The results of mouse protection tests on sera collected from various districts of the Nuba mountains, gave positive results in every centre, ranging from 9.7 per cent. positive in Heiban up to 78.9 per cent. positive at Kau.

v. A general discussion and comparison of the histological changes observed in the liver in cases of yellow fever and Weil's Disease. The author advocates the further examination of the liver in cases of Weil's Disease in various parts of the world in order to exclude the possibility of any changes, resembling those in yellow fever, occurring under exceptional conditions. An appendix to the note contains a description by BLOCH and GODIN of the technique for the preparation of paraffin sections of the liver for the histological diagnosis of yellow fever. The pieces of liver are fixed in Duboscq-Brasil's *liquid for 24 hours, embedded in paraffin, sections cut 5 μ thick, and stained as follows:—

Mayer's haemalum 10 minutes; rinse in water; differentiate a few seconds in 90 per cent. alcohol containing 5 drops HCl per 100 ccm.; wash in tap-water for 5 minutes; stain for 3 minutes in 1 per cent. bluish Eosin (Microcolor) in tap-water; wash repeatedly in water; stain and differentiate for 3 minutes in an alcoholic solution of safranin; dehydrate very rapidly in absolute alcohol, which removes the excess of safranin, pass through toluol and mount in neutral Canada balsam.

vi. The hyper-immune serum is obtained by immunizing a rhesus monkey either by the injection of virus and immune serum or attenuated virus, and then after an interval of 6 or more weeks the animal is given a second injection of virulent viscerotropic virus. The serum is collected on the 9th day after this second injection and the serum from 10 or more animals is mixed together. This serum is found to have a titre at least 20 times, and may be 60 to 80 times, stronger than that used in ordinary vaccination. Consequently only about 4 cc. is all that is required for an average-sized person, instead of the large volume generally required for virus and immune serum vaccination. Hyperimmune serum and virus has now been used in the vaccination of 35 persons in New York, and one patient showed a post-vaccinal reaction which was severe for 6 days and slight pains in the knees persisted for some time afterwards. Such reactions seem to be rare, however, for 500 patients in Brazil were vaccinated by this method without any severe reactions being observed.

E. H.

PARIS: OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. **Session of October, 1936. Report of the Yellow Fever Commission.** [Mimeographed translation. 2 pp.]

During the first nine months of 1936 the following cases of yellow fever have been notified; for South America, 16 in Bolivia, 181 in 7 States of Brazil, and 51 in Colombia; for West Africa, 13 cases in French Colonies and 7 in British Colonies. The results of mouse protection tests carried out in Central America and the islands of the Caribbean Sea agree in general with known epidemiological facts, but in the Anglo-Egyptian Sudan, a high proportion of positive tests, reaching 78 per cent. in the Kau district of Bahr-el-Ghazal, is not

* Picric Acid 1 gm.; Glacial Acetic Acid 10–15 ccm.; Formalin 50–60 ccm.; 75–80 per cent. Alcohol, 150 ccm.

correlated with the presence in the past of any disease clinically resembling yellow fever. In the Belgian Congo, the serum of persons negative in 1932 and 1933 has been re-examined and in 6 per cent. of these cases the serum had become positive although no disease resembling yellow fever had been known to occur in the meantime. An epidemic of infectious jaundice in the Libenge region, near Ubangi, was followed by a rise in the number of positive tests to 29 per cent. among natives who stated that they had not had jaundice and 46 per cent. among those who had recovered from jaundice. This outbreak, however, has not been identified with yellow fever [see iii above].

Viscerotropic yellow fever virus attenuated by culture has now been used, combined with immune serum, on 380 persons in London, 35 in New York and 500 in Rio de Janeiro, without producing any noticeable reaction attributable to the virus. Drs. SAWYER and BAUER have prepared a hyperimmune serum from the rhesus monkey with an average activity 20 times, and in some cases 60 to 80 times, the usual activity of human sera. Of 535 persons on whom this was used, only one showed a severe serum reaction. The immunity following vaccination evidently does not last as long as that following an attack of the disease, therefore it is advisable to re-examine the serum two to three years later and if necessary to re-vaccinate.

The Commission state as their opinion that a person exposed to yellow fever infection may be considered liable to introduce yellow fever into another country for a period of 6 days after leaving an infected area.

E. H.

BEEUWKES (Henry). Clinical Manifestations of Yellow Fever in the West African Native as observed during Four Extensive Epidemics of the Disease in the Gold Coast and Nigeria.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. June 30. Vol. 30. No. 1. pp. 61–86. With 3 charts.

The author gives an account of four epidemics of yellow fever in West Africa together with a description of the towns in which they occurred and facts bearing on the epidemiology.

The first of these epidemics, and also the first large outbreak of yellow fever exclusively among natives ever observed in West Africa, occurred during the spring and summer of 1926 at Asamankese, Gold Coast. It is estimated that the total number of cases was over 1,000, roughly 25 per cent. of the entire population, and the mortality was about 13 per cent. Severe as well as mild cases occurred among children, including two babes in arms. A second epidemic similar to the above occurred at Suhum, 42 miles north of Accra, immediately after the one at Asamankese. The percentage of cases affected seems to have been much lower, but exact estimates could not be made. The third epidemic occurred at Larteh, a town of about 4,000 inhabitants, 35 miles north-east of Accra, during 1927. It is estimated that the cases totalled over 200 and the deaths more than 30. The fourth epidemic included in this report occurred in 1928 at Ife, a primitive town of about 35,000 inhabitants, 55 miles due east of Ibadan. No accurate estimate could be made of the number of cases but protection tests carried out with the sera of two groups of children gave respectively 68 and 72 per cent. of positives.

Clinical observations were made on fatal, severe, and mild cases of yellow fever from these various centres and brief case histories are

given to illustrate the varying symptomatology. In 33 mild cases, the most constant symptoms were headache, pain in back and extremities, photophobia, anorexia, chill at onset, prostration, congestion of the eyes, typical tongue, small, coated, rather pointed, with red edges and tip. Icterus, vomiting and epigastric tenderness occurred in about half the cases and enlarged liver, tender liver, congested gums, bleeding gums, and vomiting with blood were present in diminishing frequency. Albuminuria was a constant feature. The temperature rose to 102.1°F. on the first day, accompanied by a pulse rate of 106, and the temperature returned to normal by the 5th day.

In 71 severe cases (not fatal) epigastric tenderness, vomiting, icterus, congested and bleeding gums, enlarged and tender liver, were among the symptoms showing higher percentages than in the mild cases; and also casts were almost twice as common.

The paper should be consulted in the original for further details of the main clinical manifestations considered by the author. *E. H.*

SIERRA LEONE. ANNUAL REPORT OF THE MEDICAL AND SANITARY DEPARTMENT FOR THE YEAR 1935 [OAKLEY (Philip D.), Director of Medical Services]. Appendix G. pp. 78-81.—**A Health Report on the Incidence of One Definite and Several Suspected Cases of Yellow Fever in Freetown, Sierra Leone** [DUNCAN (J. A. A.), Assistant Director of Medical Services].

In spite of the many epidemics of yellow fever that have occurred along the West African coast, Freetown seemed to have remained uninfected since 1910, but in January 1935, the post-mortem findings in the case of a European resident showed that the disease was present, even if in a limited and sporadic form. Although no further cases occurred in Europeans, in February and March a series of cases arose in Africans suggestive of yellow fever, but only two out of 14 specimens of serum from these cases gave a positive mouse-protection test. On the occurrence of these two suspected cases Freetown was declared an infected area, but in the absence of any further cases at the end of March the port was declared free of infection. Nevertheless, since that date further cases showing similar signs and symptoms have occurred, but in no case has the patient died, nor has a positive result been obtained from the examination of the serum. *E. H.*

FINDLAY (G. M.) & DAVEY (T. H.). **Yellow Fever in the Gambia. II.—The 1934 Outbreak.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 151-164. With 2 figs. on 1 plate & 1 map.

A description of the epidemic of yellow fever that took place in Bathurst in 1934 during which, although only 6 cases were definitely diagnosed as yellow fever, conclusive evidence is brought forward that there were many more cases of the disease. Although yellow fever epidemics have never been described among Africans living in the Protectorate, a survey of the Gambia shows that in a number of villages from 20 to 33 per cent. of the inhabitants possess immune bodies to yellow fever.

In a discussion of this difficult problem the authors point out that there is no proof either that yellow fever is constantly present in

Bathurst or that it is introduced by shipping. The only external source of infection would seem to be the surrounding country where the possibility of the occurrence of jungle yellow fever cannot be ignored. However, the Bathurst outbreak was typically urban in character and the occurrence of an epidemic may be due to variation in one or more of the three factors concerned, *viz.*, the virus, *Aedes aegypti*, and the non-immune human being.

The disease does not seem to be endemic in Bathurst but it is advisable to keep the mosquito index at zero in order to guard against the possibilities of reintroduction of the virus. E. H.

SOPER (Fred L.). **Jungle Yellow Fever. A New Epidemiological Entity in South America.**—Reprinted from *Rev. Hyg. e Saude Publica*. 1936. Apr. Vol. 10. No. 4. pp. 107-144. With 3 figs. on 2 plates, 4 graphs & 2 maps. [24 refs.]

A valuable summary of recent investigations on the epidemiology of yellow fever in South America with special reference to jungle yellow fever. The author includes details of observations on various outbreaks, from that in Espirito Santo, Brazil, in 1932, down to the one in Muchiri (Abapo), Bolivia, in May 1935.

The results of mouse protection tests with sera from monkeys captured in Colombia, Matto Grosso and Minas Geraes are given in the following table and show that many of these animals possess a naturally acquired immunity and support the view that they constitute a reservoir for the disease.

Results of Mouse Protection Tests with Sera from Monkeys captured in Colombia, Matto Grosso and Minas Geraes.

Captured in	Species	No. Exam.	No Pos.
Restrepo, Intendencia de Meta, Colombia ...	<i>Callicebus ornatus</i> (1)	4	3
Planalto Region of Matto Grosso, Brazil :—	<i>Saimiri sciureus</i> (1)	1	1
Ponte Alta ...	<i>Pseudocebus apella</i> (L.) (2)	1	1
Deputado ...	<i>Pseudocebus apella</i> (L.) (2)	1	1
Furriel ...	<i>Pseudocebus apella</i> (L.) (2)	3	3
Minas Geraes, Brazil :—			
Mun. Araguary, (Vendinha)	<i>Hapale pemicillata</i> (Goefr.) (2)	2	0
Mun. Araguary, Faz. Patrona	<i>Pseudocebus apella</i> (L.) (2)	1	1
Mun. Campina Verde			
Faz. Rio Verde ...	<i>Pseudocebus apella</i> (L.) (2)	1	0
Mun. Patos, (Capellinha de Chumbo) ...	<i>Pseudocebus apella</i> (L.) (2)	1	0
Mun. Patos, Faz. Alberto ...	<i>Pseudocebus apella</i> (L.) (2)	1	0
Mun. Patos, Faz. Bananal ...	<i>Pseudocebus apella</i> (L.) (2)	57	8
Mun. Patos, Faz. Pantano ...	<i>Pseudocebus apella</i> (L.) (2)	20	0
Total ...		93	18

(1) Identified in October 1935 by Mr. G. H. H. Tate, Assistant Curator of South American Mammals of the Department of Mammalogy of the American Museum of Natural History, New York.

(2) Identified by Professor Alipio de Miranda Ribeiro, Chefe da Secção de Zoologia, Museu Nacional, Rio de Janeiro, Brazil.

E. H.

MATHIS (Maurice). Diagnostic de la fièvre jaune par inoculation intracérébrale du sang de malade à la souris blanche. [**The Diagnosis of Yellow Fever by the Intracerebral Inoculation of the Patient's Blood into White Mice.**—*C. R. Acad. Sci.* 1936. Sept. 14. Vol. 203. No. 11. pp. 547-548.

A description of the infection of 6 white mice by the intracerebral inoculation of the blood of a French patient in the neighbourhood of Dakar, who merely showed a very slight fever, and never any trace of albuminuria. A monkey also inoculated with the blood of this patient died of typical yellow fever. This is stated to be the first strain of mouse virus obtained direct from a human source. It is proposed to call it strain Ricou. E. H.

MATHIS (C.), DURIEUX (C.) & MATHIS (M.). La vaccination contre la fièvre jaune avec le vaccin au jaune d'oeuf de Laigret. [**Vaccination against Yellow Fever with Laigret's "Egg-Yolk Vaccine."**—*Bull. Acad. Méd.* 1936. Oct. 20. 100th Year. 3rd Ser. Vol. 116. No. 31. pp. 226-238.

The authors state that using attenuated mouse virus in phosphatic suspensions from June 1934 to December 1935, 23,890 yellow fever vaccinations have been effected in French West Africa with only a single death [referred to below]. Recently the authors have used a phosphatic suspension of infected mouse brain mixed with egg yolk as recommended by NICOLLE and LAIGRET [this *Bulletin*, 1935, Vol. 32, p. 880].

Records are given of the results of vaccinating 450 persons, 400 whites and 50 negroes, at Dakar, by this method. The 50 negroes showed no reactions whatever; the results with 376 of the whites are as follows:—no reaction 226, reaction after vaccination 150, including 67 mild, 49 moderate, and 34 prolonged reactions.

The mild reactions generally occur on the 5th or 6th day and consist merely of slight headache and a little malaise or lassitude. The moderate reactions generally last one to three days and the headache is rather more severe, accompanied by slight fever (37.5° to 39.5° C.).

The prolonged reactions are characterized by a relapse about the 18th day which may or may not be preceded by a primary vaccinal reaction. The symptoms observed are fever up to 40° C., headache, pain in the joints and muscles, photophobia, cutaneous hyperaesthesia, itching, stiffness of the neck, asthenia, etc. Sometimes gastric disturbances and hepatic insufficiency occur. Clinical details are given of representative cases, all of which recovered without any after effects.

The authors examined the blood of some of the vaccinated persons and by intracerebral inoculation into mice demonstrated the presence of yellow fever virus in the circulation, even in persons showing no reaction after vaccination. E. H.

BARRAUX (A.), MONTEL (E.) & BORDES (L. A.). Encéphalomyélite disséminée à forme subaiguë et vaccination antiamarile. [**A Subacute Form of Disseminated Encephalomyelitis and Anti-Yellow Fever Vaccination.**—*Marseille-Méd.* 1936. June 5. Vol. 73. No. 16. pp. 755-759.

A discussion of the case of a patient who was vaccinated by Laigret's method in August 1934. He showed a violent reaction immediately

after the inoculation, but the symptoms disappeared after three weeks. Four months after the vaccination, however, the patient developed a disseminated encephalomyelitis to which he succumbed.

This case has been discussed previously and MOLLARET [this *Bulletin*, 1936, Vol. 33, pp. 619-20] was of the opinion that the symptoms were caused by a mouse virus; whilst LAIGRET [*ibid.*, p. 620] thought that such accidents might be due to the neurotropic yellow fever virus. The present authors suggest the hypothesis of one of the known human viruses pre-existing in the patient and developing in the central nervous system, as a result of it becoming more susceptible after the yellow fever vaccination. E. H.

LAIGRET (J.). Au sujet des réactions nerveuses de la vaccination contre la fièvre jaune. [**Nervous Reactions after Vaccination against Yellow Fever.**—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 823-827.

A reply to SOREL [see above, p. 337] concerning nervous reactions following yellow fever vaccination with attenuated mouse virus.

E. H.

LAIGRET (Jean) & DURAND (Roger). Virus isolé des souris et retrouvé chez l'homme au cours de la vaccination contre la fièvre jaune. [**A Virus isolated from Mice and recovered from Man in the Course of Vaccination against Yellow Fever.**—*C. R. Acad. Sci.* 1936. July 20. Vol. 203. No. 3. pp. 282-284.

A description of the isolation of a virus from the brains of apparently normal mice by inoculation into guineapigs. The infection in the mice seems to be of very long duration but in guineapigs there is usually an incubation period of about 6 days followed by a febrile attack accompanied by marked emaciation also lasting for 6 days. About 40 per cent. of the guineapigs succumb to the infection and those that recover are immune against a second inoculation. Five monkeys were inoculated intracerebrally but only one showed an abnormal cerebrospinal fluid accompanied by fever.

This virus has been isolated from the cerebrospinal fluid of a man who had been vaccinated against yellow fever and showed a benign meningeal reaction. A suspension of fowl embryos, intended for tissue cultures, was inoculated into guineapigs and produced a transmissible infection apparently identical with the foregoing. It would seem, therefore, that the central nervous system of mice, man and fowl embryos may contain a neurotropic virus, which is pathogenic to guineapigs, but produces inapparent infections in rats and rabbits. The presence of this virus affords an explanation of some of the meningeal reactions following yellow fever vaccination by means of mouse virus. E. H.

STEFANOPOULO (G. J.), LAURENT (P.) & WASSERMANN (R.). Présence d'anticorps antiamarils dans le lait de femme immunisée contre la fièvre jaune. [**The Presence of Antibodies in the Milk of Women immunized against Yellow Fever.**—*C. R. Soc. Biol.* 1936. Vol. 122. No. 23. pp. 915-917. [11 refs.]

The authors examined the milk of nine women; one that had acquired immunity against yellow fever in nature, three that had been vaccinated by the serum-virus method, and five controls. The usual

protection tests were made in mice and it was found that the milk of the first four women all contained antibodies against yellow fever, whilst the five controls were negative.

The presence of these antibodies in the milk of immune women may be of interest in connexion with the probable immunity of new-born infants of such mothers. *E. H.*

FINDLAY (G. M.) & MACKENZIE (R. D.). **Attempts to produce Immunity against Yellow Fever with Killed Virus.**—*Jl. Path. & Bact.* 1936. July. Vol. 43. No. 1. pp. 205–208. [10 refs.]

The authors attempted to produce immunity in rhesus monkeys, hedgehogs and mice by the inoculation of large doses of yellow fever virus inactivated by means of formalin. These animals were inoculated with varying doses of the serum of a yellow fever monkey collected on the first or second day of fever and exposed to the action of 4 per cent. formal for 10 days at 4°C. The results are given in tabular form and show that with monkeys no immunity followed doses of 35 cc. inactivated serum. However, one of the hedgehogs was protected and 33 out of 50 mice survived when doses of 1 cc. were inoculated.

It would seem, therefore, that although dead yellow fever virus may produce immunity its use as a vaccine is impracticable owing to the very large amount of virus necessary to produce any effect. *E. H.*

FINDLAY (G. M.) & MAHAFFY (A. F.). **Paths of Infection of the Central Nervous System in Yellow Fever.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 355–362. [25 refs.]

The authors studied the three possible routes of approach for yellow fever virus to the central nervous system. No evidence was obtained that the virus is able to travel along the peripheral nerves towards the central nervous system. Yellow fever virus can pass through the blood-brain barrier when this is artificially ruptured, and many other factors are well known to affect this barrier, but the authors consider that the method of approach from the naso-pharynx by the olfactory nerves is the most usual.

It is suggested that, as in certain other infections, the yellow fever virus may escape from the blood stream on to the nasal mucosa and thence pass by the olfactory nerves to the brain.

Experimental evidence in favour of this view is afforded by (1) finding virus on the nasal mucosa of a hedgehog, 24 hours after an intraperitoneal inoculation; (2) the distribution of virus in the brains of young mice following intraperitoneal inoculation, showing that in the early stages there is a greater tendency for virus to be present in the fore-brain than in the mid- or hind-brain; (3) the intranasal installation of picric acid in adult mice was found to prevent infection when the virus was instilled intranasally; and (4) a similar intranasal instillation of picric acid into very young mice prevented infection when these were inoculated intraperitoneally with neurotropic yellow fever virus. *E. H.*

PENNA (H. A.). **The Production of Encephalitis in *Macacus rhesus* with Viscerotropic Yellow Fever Virus.**—*Amer. Jl. Trop. Med.* 1936. May. Vol. 16. No. 3. pp. 331–339.

By the intraperitoneal inoculation of yellow fever immune serum followed immediately by the intracerebral inoculation of viscerotropic

yellow fever virus into *Macacus rhesus*, the author was able to produce encephalitis in these monkeys without any visceral changes developing. Serial intracerebral subinoculations with this virus, using the same technique, was carried out in two series of monkeys, in one of which a modification of the virus was noted in the 35th passage, when it acquired neurotropic affinities. In the other series the virus at the 40th passage still produced visceral lesions unless the intracerebral inoculation was accompanied by the injection of immune serum.

The first series was then carried on by intracerebral inoculations without immune serum and up to the 8th passage (48th in total series) all the monkeys developed encephalitis without liver lesions. Of three monkeys inoculated in the 9th passage, one developed encephalitis without liver lesions; the second, both encephalitis and necrotic changes in the liver; and the third monkey died in 4 days with typical yellow fever lesions in the liver and no signs of encephalitis. The series was carried on by intracerebral inoculations to the 85th passage by the use of immune serum and when again tested in 7 monkeys without immune serum all died of encephalitis. The changes obtained seem to be sufficiently marked to justify the name of neurotropic, but the author does not believe that it is entirely comparable to the mouse-brain-adapted virus of the same number of passages.

The encephalitis due to inoculation with viscerotropic yellow fever virus was not found to differ clinically or pathologically from the encephalitis produced in monkeys by inoculation with "mouse virus."

E. H.

LYNCH (Clara J.) & HUGHES (Thomas P.). **The Inheritance of Susceptibility to Yellow Fever Encephalitis in Mice.**—Reprinted from *Genetics*. 1936. Mar. Vol. 21. pp. 104–112.

SAWYER and LLOYD [see this *Bulletin*, 1932, Vol. 29, p. 198] noticed that different strains of mice showed variations in their susceptibility to intracerebral inoculation of yellow fever virus and the present authors have investigated the inheritance of this susceptibility. Mice from two sources were found to give different mortality rates varying by 31.2 per cent. When these strains were crossed the hybrids showed a mortality less than that of the susceptible strain of mice. By crossing the hybrid back to the susceptible strain the mortality rate was increased, and by crossing back to a more resistant strain the rate was lowered.

Offspring from two susceptible parents were more susceptible than the offspring from one or two resistant parents.

Susceptibility did not seem to be modified by sex. As a result of these experiments it is concluded that hereditary factors for resistance to yellow fever encephalitis are present in mice.

E. H.

MATHIS (M.). Sensibilité de la souris grise Dakaroise au virus amaril (32 passages en série). [**The Susceptibility of the Dakar Grey Mouse to Yellow Fever Virus (32 Passages in Series).**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 703–707.

The Dakar variety of wild mouse, *Mus musculus* sub-sp. *gentilis* and *spretus* Braut, was found to be refractory against infection with viscerotropic yellow fever virus as tested by intracerebral inoculations

into 23 animals. On the other hand this species is susceptible to the neurotropic virus and 32 passages in series were effected without any appreciable change being produced in the virulence of the strain.

E. H.

ROY (D. N.). **On the Role of Blood in Ovulation in *Aedes aegypti*, Linn.**—*Bull. Entom. Res.* 1936. Sept. Vol. 27. Pt. 3. pp. 423–429. With 1 fig.

The author fed *Aedes aegypti* on a human volunteer, and in some cases interrupted the feeding at various stages in the process whilst others were allowed to feed to repletion. The weight of blood ingested was then determined and the number of eggs subsequently laid by each group of mosquitoes to determine whether the blood had acted simply as a physico-chemical stimulus to the ovarian follicles or provided nutrient material for their development.

The results indicate that there is a quantitative relationship between the weight of the blood meal and the number of eggs produced. Nevertheless, this relationship does not seem to be on a graded quantitative scale, and the author finds evidence to support the view that two factors are involved, one acting directly on the follicles, stimulating them to activity, the other providing actual material for the formation of the eggs.

No evidence was obtained in support of the view that the number of eggs deposited by a mosquito varies directly with its size and it is likely that the amount of blood in the stomach exercises a greater influence.

E. H.

MERRETT (W. E. Stanley). A Brief Review of Recent Trends in Yellow Fever Research.—*West African Med. Jl.* 1936. Oct. Vol. 9. No. 1. pp. 2–9. [38 refs.]

RELAPSING FEVER AND OTHER SPIROCHAETOSSES.

CAMINOPETROS (Jean) & TRIANTAPHYLLOPOULOS (E.). Existence en Grèce d'une fièvre récurrente dont le spirochète revêt les caractères de "*Spirochaeta hispanica*" agent de la fièvre récurrente hispano-africaine. [The Existence in Greece of a Relapsing Fever of which the Spirochaete recalls the Characters of *Spirochaeta hispanica*, the Causative Organism of Spanish-African Relapsing Fever.]—*Bull. Acad. Méd.* 1936. June 16. 100th Year. 3rd Ser. Vol. 115. No. 23. pp. 822-825. Also in *Ann. Parasit. Humaine et Comparée*. 1936. Sept. 1. Vol. 14. No. 5. pp. 429-432.

Cases of relapsing fever of unknown origin have been recorded from several villages in the plains of Messina, Peloponnesia, but hitherto the nature of this fever has not been determined. The authors have inoculated the brains of wild rats caught in these regions into guinea-pigs, and isolated a spirochaete which in its general character, including transmission by *Ornithodoros erraticus*, resembles *Spirochaeta hispanica*. Cross-immunity experiments were made with the Moroccan strain and the Greek strain would seem to be a variety of the Spanish-Moroccan strain, and the name of *S. hispanica* var. *peloponesica* is proposed for it. A number of *Rhipicephalus sanguineus* collected from a dog suffering from the disease were inoculated into 5 guinea-pigs, one of which became infected with this spirochaete. E. Hindle.

CACCIAPUOTI (Raffaele). Febbre ricorrente nell' Acchelè Guzai (Eritrea). [Relapsing Fever in the Acchelè Guzai (Eritrea).]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. May. Vol. 17. No. 5. pp. 289-301.

The author has himself observed 40 cases and 20 others in the locality were reported to him as occurring among a battalion stationed in Addi Caih. The first four of the last all died; the outbreak took place at the end of August 1935. In September in a nearby village there were 4 more cases, 1 fatal; in November in the same district of Scimezana, he saw 20 cases in 4 houses, three of the patients died. In two other villages of the same district 3 died out of 13 attacked, and one of three seen in Addi Uirà. Among the sixty there were twelve deaths. In 33 of the 40 patients under the author's care diagnosis was made by finding the spirochaete in the blood. Brief details of all 40 are given, followed by an analysis of individual symptoms as regards their presence and frequency. H. H. S.

CACCIAPUOTI (Raffaele). Contributo allo studio della febbre ricorrente da pidocchi in Eritrea. [Louse-borne Relapsing Fever in Eritrea.]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Sept. Vol. 17. No. 9. pp. 546-556. With 1 map.

The author examined inhabitants in 36 villages scattered in 11 districts in Acchelè Guzai (Eritrea). The numbers of inhabitants in a village ranged from 100 to 700, and the total populations of all the districts was 10,550. Among them were 219 found suffering from relapsing fever and 29 died, a fatality rate of 13.2 per cent. A brief note is made of the chief clinical symptoms and their relative prevalence. H. H. S.

BALTAZARD (M.). Individualité stricte des souches marocaines du spirochète hispano-africain. [**The Strict Individuality of Moroccan Strains of Spanish-African Relapsing Fever.**].—*Bull. Soc. Path. Exot.* 1936. June 10. Vol. 29. No. 6. pp. 667-671.

The author has made cross-immunity tests with 12 strains of *Spirochaeta hispanica*, seven isolated from wild rats in Casablanca, two from *Ornithodoros*, and three from human cases of relapsing fever, also in Casablanca. Details are given showing that infection with each of these strains in guineapigs and rats was followed by immunity only against that particular strain, and that reinoculation successively with any or all of the other strains was followed by infection.

These observations confirm those of NICOLLE and his collaborators in Tunis, who have never found any two strains of relapsing fever which were antigenically the same. E. H.

ACKERMANN (Victor) & PROTASOV (Nikolai). Einige klinische und parasitologische Beobachtungen beim experimentellen Zecken-Rückfallfieber. [**Some Clinical and Parasitological Notes on Experimental Tick Fever.**].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Aug. Vol. 40. No. 8. pp. 352-358. [14 refs.]

The authors have studied the Central Asiatic strain of tick fever in guineapigs and find that two types of movement can be distinguished in the spirochaetes, one serpentine and the other rotatory, depending on the external conditions. A ring-like modification is stated to be a protective modification.

Spirochaetes were found to retain their motility and virulence in blood kept in the ice-chest up to 107 days. They multiplied the first 2 to 4 days and then their numbers gradually diminished. Hydrogen peroxide had very little effect on the organisms. Neosalvarsan (1 : 1,000) killed the spirochaetes and quinine (1 : 1,000) had an even stronger lethal action.

The peripheral blood of infected guineapigs was found to contain spirochaetes within 24 hours after inoculation. The first attack of relapsing fever in guineapigs is not followed by any lasting immunity, but after repeated attacks the immunity is probably more persistent.

The spirochaetes were found to pass through the placenta and infect the unborn young. E. H.

BRUMPT (E.). Sur l'identification des spirochètes récurrents. Etude d'une souche de *Spirochaeta recurrentis* (?) conservée depuis longtemps sur souris, dans divers laboratoires d'Allemagne. [**The Identification of Relapsing Fever Spirochaetes. The Study of a Strain of *Spirochaeta recurrentis* (?) preserved for Long Periods in Mice, in Various German Laboratories.**].—*Ann. Parasit. Humaine et Comparée.* 1936. Nov. 1. Vol. 14. No. 6. pp. 586-596. [25 refs.]

An interesting discussion of the nature of the Frankfort strain of *Spirochaeta recurrentis*, generally supposed to be of Russian origin, which after thousands of passages in mice has lost its pathogenicity to man, and has been used for some years in pyretotherapy.

This strain differs from four Chinese strains of *S. recurrentis* studied by the author, in its power of surviving for at least 27 months in the body of *Ornithodoros moubata*, in which, however, it does not invade either the salivary glands or the coxal fluid. On the other hand, the Frankfort strain disappears in a few weeks from the body of *Ornithodoros tholozani*, the natural carrier of *S. persica*. This spirochaete will live for at least 18 months in *O. moubata* and for long periods in *O. talajae*, but neither of these ticks shows infection of the salivary glands or coxal fluid.

Similarly *S. turicatae* retains its virulence for at least 19 months in *O. moubata*, and 14 months in *O. migonei*, but neither of these ticks can transmit the infection by the bite. *Spirochaeta novyi*, which is probably a race of *S. recurrentis*, because it persists for at least 9 days in the louse, lives only for a few days in *O. moubata* and *O. turicata*.

In view of the long survival of the Frankfort strain in *O. moubata*, the author considers that it is probably a strain of *S. duttoni*, which after thousands of passages in mice has lost its power of invading the salivary and coxal glands, and in consequence is not transmitted by the bite of ticks containing the spirochaete. E. H.

CHUNG (Huei-lan). **Studies on the Transmission of Relapsing Fever in North China. I. Preliminary Observations.**—*Chinese Med. Jl.* 1936. Dec. Vol. 50. No. 12. pp. 1723–1734. With 4 figs. on 2 plates.

The author made some observations on an outbreak of relapsing fever at an orphanage in Peiping. Nine out of twelve body-lice from the garments of patients were found to contain mobile spirochaetes, and splenectomized squirrels inoculated with the contents of other lice from the same source became infected with the disease. Bed-bugs fed on infected squirrels contained living spirochaetes for at least 25½ hours, and these organisms produced infection in normal splenectomized squirrels by instillation in the conjunctiva and oral cavity. Squirrel-lice from experimentally infected Chinese squirrels also contained spirochaetes which were similarly shown to be infective. E. H.

CHUNG (Huei-Lan) & FENG (Lan-Chou). **Studies on the Development of *Spirochaeta recurrentis* in Body Louse. A Preliminary Report.**—*Chinese Med. Jl.* 1936. Sept. Vol. 50. No. 9. pp. 1181–1184.

The authors fed different batches of body lice, bred in the laboratory, on a [presumably Chinese] relapsing fever patient whose blood contained 20–30 spirochaetes per oil immersion darkfield. They were subsequently fed on normal individuals and dissections made every day until all the lice were dissected. The darkground method of examination was used throughout, supplemented by inoculating the suspected material into splenectomized squirrels.

The gastric juice was found to be detrimental to these spirochaetes and none was present in the stomach 8 hours after an infective feed. Only about 1 to 5 per cent. gain access into the coelomic fluid and tissues where they multiply. Spirochaetes can be found in the coelomic fluid and legs within 2 hours and remain constantly present in an infective form for at least 18 days. They multiply in this position

and there is no necessity nor reason for accepting the theory of invisible forms being present.

The faeces of infected lice are not infectious although dead spirochaetes may be found in them during the first 6 hours after an infective feed. Moreover, the salivary glands and Malpighian tubules do not contain *S. recurrentis*. Congenital transmission of the infection was not observed and conjugation does not transmit the spirochaete from lice of one sex to those of the opposite sex. E. H.

FENG (Lan-Chou) & CHUNG (Huei-Lan). **Studies on the Development of *Spirochaeta duttoni* in *Ornithodoros moubata*. A Preliminary Report.**—*Chinese Med. Jl.* 1936. Sept. Vol. 50. No. 9. pp. 1185–1190.

Using similar methods to those outlined in the preceding article, the authors have studied the development of a French Congo strain of *S. duttoni* in *Ornithodoros moubata*. After feeding on an infected animal the ticks were kept at 25° to 30°C. and dissected at various intervals up to 41 days after the infective meal.

Spirochaetes were found in the stomach up to the 11th day but from the 12th day onward no more were seen there. Within 6 hours after feeding spirochaetes appear in the legs and coelomic fluid, from which they invade the salivary glands, nerve ganglion, and the coxal glands and their reservoirs. Multiplication by transverse division takes place in these organs as well as in the body cavity and after the 3rd or 4th day numerous spirochaetes are present. Mice inoculated with organs containing spirochaetes always became infected, while those injected with the Malpighian tubules and faeces in which spirochaetes could not be found remained sterile.

From these experiments the authors conclude that it is unnecessary to assume the presence of a granular phase in the life history of *Spirochaeta duttoni* in the tick. E. H.

DE BUEN (Sadi). Observaciones sobre el comportamiento del "Treponema hispanicum" en el "*Ornithodoros erraticus*." II. Sobre la teoría de la fases "letal" y "normal" del parásito de la recurrente española. [**On the Behaviour of *Spirochaeta hispanica* in *Ornithodoros erraticus*.**]—*Rev. San. e Híg. Pública.* 1936. July. Vol. 11. No. 7. pp. 13–18.

Previous investigations led the author to state an hypothesis that there existed a phase of the virus which caused a high rate of deaths in mice, a phase in the life of the spirochaete passed in the stomach of the tick, and another phase, present in the salivary glands of the tick, which set up the more "normal" type of disease in mice. Further research has caused him to modify this view. He found that from 5 to 21 days after the infecting feed the "virus" is visible in the stomach, but this when injected gives rise to the normal disease. Later, when there is salivary gland infection, it is not possible to determine with certainty whether the infection is transmitted by the latter, or by regurgitation from the stomach. The author states: "Fresh experiments do not confirm the hypothesis that there are two phases—a lethal and a normal—in the life of the parasite in the tick."

H. H. S.

POPOV (P. P.) & ACHUNDOW (I.). Das Vorkommen des *Ornithodoros Lahorensis* Neumann, 1908 in Aserbajdjan und die Frage ueber die Anwesenheit des Zeckenrückfallfiebers in A.S.S.R. [**The Occurrence of *Ornithodoros lahorensis* Neumann, 1908 in Azerbaijan and the Problem of the Presence of Tick-transmitted Relapsing Fever in A.S.S.R.**].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. July. Vol. 40. No. 7. pp. 289-295. With 4 figs. [28 refs.]

Ornithodoros lahorensis was found to occur in Azerbaijan in considerable numbers, favourite localities for them being crevices in the stone walls of the old caravanseries and especially cracks in the wood of the sheep stalls. In addition the burrows of rodents are considered to be another probable site.

Details are given of a spontaneous case of typical relapsing fever, following the bite of an undetermined species of tick. E. H.

BRUMPT (E.). Non transmission de la fièvre récurrente de l'Asie centrale à *Spirochaeta persica*, par l'*Ornithodoros canestrinii*. [**The Non-Transmission of the Relapsing Fever of Central Asia (*Spirochaeta persica*), by *Ornithodoros canestrinii*.**].—*Ann. Parasit. Humaine et Comparée.* 1936. Sept. 1. Vol. 14. No. 5. pp. 433-435.

Two specimens of *Ornithodoros canestrinii* were fed on a guineapig infected with *Spirochaeta persica* and showing about 20 spirochaetes per field. These two ticks after intervals of 3 months and a year were fed on normal guineapigs, neither of which became infected.

E. H.

BRUMPT (E.). Action nulle du froid sur le pouvoir infectieux des Argasins vecteurs de fièvres récurrentes. [**The Absence of any Effect of Cold on the Infective Power of Argasid Carriers of Relapsing Fever.**].—*Ann. Parasit. Humaine et Comparée.* 1936. Sept. 1. Vol. 14. No. 5. pp. 436-439.

Respective batches of *Argas persicus* infected with fowl spirochaetosis, *Ornithodoros erraticus* infected with *Spirochaeta hispanica*, and *O. tholozani* infected with the relapsing fever of Central Asia, were kept in the ice chest at 5° to 7°C. for several weeks and then fed on susceptible hosts. All the animals bitten by these ticks were infected as readily as control animals on which ticks fed that had not been exposed to the action of cold.

E. H.

BRUMPT (E.). Transmission expérimentale exceptionnelle de la fièvre récurrente du Maroc à *Spirochaeta hispanica* par la tique cosmopolite *Rhipicephalus sanguineus*. [**The Exceptional Experimental Transmission of Moroccan Relapsing Fever (*S. hispanica*) by the Cosmopolitan Tick *R. sanguineus*.**].—*Ann. Parasit. Humaine et Comparée.* 1936. Nov. 1. Vol. 14. No. 6. pp. 564-570. [22 refs.]

About 3,500 newly hatched hexapod larvae of *Rhipicephalus sanguineus* were allowed to become engorged on a guineapig infected with *Spirochaeta hispanica*. Twenty-seven days later 800 nymphs hatched from these larvae were fed on a guineapig, which showed

spirochaetes in its blood after an incubation period of 9 days. A second guineapig inoculated 2 days later with a suspension of the contents of 60 of these nymphs remained uninfected. In another similar experiment, one out of three guineapigs became infected, but of a total of 11 guineapigs, either bitten or inoculated with the contents of these ticks, only these two became infected, and attempts to infect a young dog were also negative.

It would seem, therefore, that *Rhipicephalus sanguineus* is of little importance as a carrier of *S. hispanica*. E. H.

BRUMPT (E.). L'ixodiné *Rhipicephalus sanguineus* ne transmet pas expérimentalement la fièvre récurrente de l'Asie Centrale à *Spirochaeta persica*. [The Ixodid *R. sanguineus*, experimentally does not transmit Central Asiatic Relapsing Fever (*S. persica*).]—*Ann. Parasit. Humaine et Comparée*. 1936. Nov. 1. Vol. 14. No. 6. pp. 571-573.

Large numbers of larval and nymphal stages of *R. sanguineus* were fed on guineapigs infected with *Spirochaeta persica*, and subsequently fed on, or their contents inoculated into, normal guineapigs, with uniformly negative results. E. H.

BRUMPT & CAMINOPETROS (Jean). Non transmission de la fièvre récurrente grecque à *Spirochaeta hispanica* var. *peloponesica*, par la tique *Rhipicephalus sanguineus*. [The Non-Transmission of Greek Relapsing Fever (*S. hispanica* var. *peloponesica*) by the Tick *R. sanguineus*.]—*Ann. Parasit. Humaine et Comparée*. 1936. Nov. 1. Vol. 14. No. 6. pp. 574-577.

A record of negative attempts to infect 36 guineapigs by the bites or inoculation of the contents of *R. sanguineus* that had previously fed on animals infected with the Greek strain of *S. hispanica*.

E. H.

BRUMPT (E.). Le spirochète (*Spirochaeta recurrentis*) de la fièvre récurrente à poux de Chine, n'est pas transmis expérimentalement par la piqûre de l'*Ornithodoros moubata* et ne se conserve pas chez cet acarien. [The Spirochaete of Chinese Relapsing Fever (*S. recurrentis*) is not Transmitted Experimentally by the Bite of *Ornithodoros moubata* and does not persist in that Tick.]—*Ann. Parasit. Humaine et Comparée*. 1936. Nov. 1. Vol. 14. No. 6. pp. 578-585. [21 refs.]

A record of negative attempts to transmit two strains of *Spirochaeta recurrentis* by the bites or inoculation of the contents of *Ornithodoros moubata*. Dr. Feng Lan-Chou, in Peking, found that these spirochaetes persisted not longer than a week in *O. moubata*. E. H.

BRUMPT (E.). Distribution géographique et rôle en pathologie humaine de l'*Ornithodoros savignyi*. [The Geographical Distribution and Significance in Human Pathology of *Ornithodoros savignyi*.]—*Ann. Parasit. Humaine et Comparée*. 1936. Nov. 1. Vol. 14. No. 6. pp. 640-646. [28 refs.]

This species has been found by T. MONOD in large numbers in the neighbourhood of Azaouad, Timbuctoo, and is widely distributed

throughout Africa and various parts of Asia, including Ceylon (CRAWFORD). Nevertheless there is no record of *O. savignyi* ever being naturally infected with any strain of spirochaete, although experimentally it can transmit by bite several species, including *Spirochaeta duttoni*, *S. hispanica*, and *S. normandi*. The fact that in regions where *O. moubata* is infected with *S. duttoni*, and *O. savignyi*, living under the same conditions and having similar habits, is uninfected, may be explained by the fact that in the latter the spirochaetal infection does not seem to be transmitted hereditarily, which diminishes the chance of any natural infection becoming established in it. E. H.

HERMS (W. B.) & WHEELER (C. M.). *Ornithodoros hermsi* Wheeler as a Vector of Relapsing Fever in California.—*Jl. Parasitology*. 1936. June. Vol. 22. No. 3. pp. 276-282.

Since the first two cases of relapsing fever recorded in California in 1922 [see this *Bulletin*, 1923, Vol. 20, p. 132] a total of 95 cases had been recorded, 46 of which occurred at Big Bear Lake and 26 at Lake Tahoe, and all at elevations of 5,000 to 8,000 ft.

Infected *Ornithodoros hermsi* have been found in the nests of rodents (chipmunks, etc.) at both these localities, and hereditary transmission of the spirochaetes from the female tick to the egg and resulting larva has been effected for both strains. Infections can be produced in mice by the bites of infected ticks at all stages and spirochaetes usually appear in the blood after about five days' incubation. Once infected a tick remains infective for the remainder of its life.

The authors include a number of observations on the life-history and habits of this tick, which is primarily a parasite of rodents but will readily feed on other animals and man. The cycle from egg to egg requires about 4 months in the case of ticks kept in the laboratory at 75°F. E. H.

DAVIS (Gordon E.). *Ornithodoros turicata*: the Possible Vector of Relapsing Fever in Southwestern Kansas. Preliminary Report.—*Public Health Rep.* 1936. Dec. 11. Vol. 51. No. 50. p. 1719.

Eleven cases of relapsing fever were reported from Clarke County, Kansas, by Dr. H. O. CLOSSON* in 1934 and other cases have been reported subsequently from this and adjoining counties.

The author has recently collected approximately 2,000 specimens of *Ornithodoros turicata* in Clarke County, from rodent burrows and attached to various animals, including rodents, prairie-dogs, owls and terrapins, and from one sand-hole containing 11 terrapins (*Terrapene ornata*) no less than 1,197 ticks were removed. The ticks were tested for infectivity by feeding on white rats, and three strains of spirochaetes were recovered from three localities, one of which was a ranch where a case of relapsing fever had occurred. It seems reasonable to assume, therefore, that *O. turicata* may be implicated in the transmission of relapsing fever in this area. E. H.

CERCIELLO (Raffaele). Considerazioni cliniche su alcuni casi di febbre ricorrente osservati in Senafè (Eritrea).—*Giorn. Ital. di Malat. Esot. e Trop.* 1936. Nov. 30. Vol. 9. No. 11. pp. 241-4, 247-50, 253, 255-6. [10 refs.]

* 1934. *Journal of the Kansas Medical Society*, Vol. 35, No. 2,

ECKHARDT (A. E.) & ECKHARDT (G.). Behandlung zerebraler Erscheinungen bei Rekurrens mit Fiebertherapie. (Vorläufige Mitteilung.) [**The Treatment of Cerebral Symptoms in Relapsing Fever by Means of Fever Therapy. (Preliminary Note.)**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. July. Vol. 40. No. 7. pp. 301-303.

The description of a case of relapsing fever in which large doses of neosalvarsan did not prevent the development of severe cerebral symptoms. The patient's temperature was 37.6°C. and no spirochaetes were found in the blood. On the analogy of the treatment of syphilis the authors gave injections of T.A.B. intravenously, followed by doses of neosalvarsan and found that the cerebral symptoms disappeared.

E. H.

SAUTERLY (Pierre). Les idées modernes sur les fièvres récurrentes. [**Modern Views on Relapsing Fever.**] [Thesis presented to the Faculty of Medicine, Algiers.]—108 pp. [Bibliography.] Imp. F. Michaud.

An incomplete summary of the literature dealing with recent observations on relapsing fever, and notes on the history of the disease containing nothing original.

E. H.

See also p. 120, RUSSELL, **Observations on Immunity in Relapsing Fever and Trypanosomiasis.**

LEPTOSPIROSIS.

HOME OFFICE. **Departmental Committee on Compensation for Industrial Diseases. Third Report to the Right Honourable the Secretary of State for the Home Department by the Departmental Committee appointed to inquire and report as to Certain Proposed Extensions of the Schedule of Industrial Diseases to which Section 43 of the Workmen's Compensation Act, 1935, applies.** [ROLLESTON (Humphry), Chairman].—16 pp. [46 refs.] 1936. London: H.M.S.O. [4d.]

This report includes a general account of the main features of infection with *Spirochaeta icterohaemorrhagiae*, discussed especially with regard to methods of diagnosis and whether it should be scheduled as an industrial disease under Section 43 of the Workmen's Compensation Act, 1915. From 1924 to October 1935, 424 notifications of the disease were received by the Local Authorities in Scotland, but of these cases only 77 were definitely accepted cases, 23 of which were fatal. The occupations of these 77 cases were 25 miners, 38 fishworkers (mainly in Aberdeen during 1934 and 1935), 6 agricultural workers and 8 miscellaneous.

After reviewing the evidence the Committee recommends that infection by *S. icterohaemorrhagiae* should entitle a workman to compensation for disablement but only if confirmed by bacteriological or serological examination. In fatal cases pathological evidence of the infection should be accepted.

In the event of the disease becoming more widespread or of other developments, it may be found that it ought no longer to be scheduled as an industrial disease. E. Hindle.

GRAF (H.) Ueber einen Fall von Weilscher Krankheit in Kamerun. [A Case of Weil's Disease in the Cameroons.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 456–460. With 2 figs.

The description of a typical case in a European who probably acquired the infection from a swimming pool. *Leptospirae* were found in the urine and when inoculated into guineapigs produced typical and fatal infections. In addition serological tests with the patient's blood furnished additional confirmation of the nature of the infection.

E. H.

ZIMMERMANN (E.). Ueber ein verbessertes Kulturverfahren der *Spirochaeta icterogenes*. [An Improved Culture Medium for *Spirochaeta icterogenes*. (? *S. icterohaemorrhagiae*).]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Sept. 10. Vol. 137. No. 5. pp. 280–282.

The culture of Weil's spirochaete rarely presents much difficulty, once it has become established, but occasionally primary cultures do not succeed. The author finds that the addition of one or two loopfuls of a sterile culture of yeast to about 1.0 cc. of their ordinary medium (10 per cent. rabbit serum in tapwater) greatly improves the growth of spirochaetes. This improvement continues in subcultures not containing yeast cells. This favourable action of yeast is destroyed by heating to 100°C. for 5 to 10 minutes and also when the cells are removed by centrifuging. E. H.

MURGATROYD (Frederick). Chronic Meningitis in Weil's Disease.—*Brit. Med. Jl.* 1937. Jan. 2. pp. 7–11. [12 refs.]

A description of a prolonged case of Weil's disease associated with a progressive type of meningitis in a farm labourer. When first seen, about two weeks after the beginning of fever, the patient was jaundiced and *S. icterohaemorrhagiae* was found in the urine, but a week later the patient's condition had improved and the jaundice had almost disappeared. About a month later the fever returned, and four months after the beginning of the illness meningeal symptoms developed, and the patient's condition got steadily worse until anti-leptospiral serum was administered. *Leptospira* were found in the cerebrospinal fluid and urine up to 25 and 33 weeks respectively from the onset of the disease, the diagnosis being made by means of guineapig inoculation.

In spite of the long duration of this infection both the cerebrospinal fluid and blood serum possessed practically no agglutinating power against the infecting organism and against various other strains of *leptospira*.

The author concludes with a useful discussion of the meningitic manifestations of Weil's disease, and points out the necessity for considering the possibility of this infection in any obscure case of meningitis, or even in cases of obscure pyrexia. E. H.

MURRAY (R. Elliott) & FIELDING (John W.). **Notes on the Silver Impregnation of *Leptospira icterohaemorrhagiae*.**—*Mcd. Jl. Australia*. 1936. May 2. 23rd Year. Vol. 1. No. 18. pp. 610–611. With 2 figs. on 1 plate.

The authors have studied various methods of silver impregnation for leptospira, and find that alkaline fixatives have a destructive influence, consequently tap water should never be used in diluting formalin or washing tissues as it is frequently alkaline.

By raising the temperature the impregnation can be completed in 5 hours using the following technique :—

- " 1. Cut strips of tissue 1.5 millimetres thick.
- " 2. Fix one hour at 50°C. or 18 hours at room temperature in (a) F.A.A.* or (b) F.A.S.†
- " 3. 70 per cent. alcohol, 30 minutes at 50°C.
- " 4. 1 per cent. silver nitrate, 30 minutes at 50°C.
- " 5. Wash in five to six changes of distilled water.
- " 6. Develop 60 minutes at 50°C. in (a) 1 per cent. pyrogalllic acid in 5 per cent. formalin, (b) 1 per cent. pyrogalllic acid, or (c) 1 per cent. quinol.
- " 7. Wash in five to six changes of distilled water.
- " 8. 50 per cent. alcohol, 15 minutes at 50°C.
- " 9. 70 per cent. alcohol, 15 minutes at 50°C.
- " 10. 90 per cent. alcohol, 15 minutes at 50°C.
- " 11. Absolute alcohol, 15 minutes at 50°C.
- " 12. Repeat absolute alcohol, 15 minutes at 50°C.
- " 13. Xylol, 15 minutes at 50°C.
- " 14. 46° to 48°C. melting point paraffin, 15 minutes.
- " 15. 50° to 52°C. melting point paraffin, 15 minutes.
- " 16. Embed in a suitable paraffin."

Microphotographs are reproduced illustrating the deleterious action of an alkaline fixative on the staining reactions of leptospira in the liver of an infected guineapig.

E. H.

POT (A. W.). **A Macroscopic Agglutination Test in Weil's Disease.**—*Lancet*. 1936. June 6. p. 1290.

A suspension of leptospirae was made by mixing the sediment from about 250 cc. of Korthof's liquid medium with 10 cc. of meat broth (pH 7.6) to which was added 0.2 per cent. of formalin. The test was made by mixing various dilutions of the serum under examination with an equal volume of the leptospiral suspension and then keeping them for 2 hours at 52°C. Sera from 26 patients positive to ordinary agglutination and lysis tests were examined in this way and 25 of them gave a well marked agglutination that could be seen macroscopically.

E. H.

POT (A. W.) & DORNICKX (Ch. G. J.). **The Complement Fixation Test in the Diagnosis of Weil's Disease.**—*Jl. Path. & Bact.* 1936. Sept. Vol. 43. No. 2. pp. 367–372.

By using an improved antigen the authors have obtained good results in the diagnosis of Weil's disease and the reaction is reliable and easy in its performance and interpretation.

* F.A.A. = formol, 5; acetic acid, 3; absolute alcohol, 46; distilled water, 46.

† F.A.S. = formol, 5; acetic acid, 3; saline solution, 92.

The antigen was prepared by centrifuging one week old cultures of leptospira in Korthof's medium for 3 or 4 hours at 3,000 r.p.m. The supernatant fluid is removed and the deposit suspended in 0.3 per cent. phenol saline in the proportion of 1 to 10.

A series of dilutions is mixed with (a) 1 : 100 dilution of an inactivated highly positive serum, and (b) 1 : 10 dilution of fresh guineapig serum, 0.3 cc. of each. After mixing the tubes are incubated at 37°C. for one hour and then 0.6 cc. of the haemolytic system added. The rack is incubated for 30 minutes and then the reading is taken.

When making tests two or three times this quantity is used and the dilution of serum which just gives complete inhibition is determined.

The results of the test were very satisfactory. 25 sera sent in for Wassermann testing were all negative ; 25 with a positive Widal gave one doubtful positive in a dilution of less than 1 : 10. The third group included 100 sera sent in for Weil's disease and were tested by the agglutination and lysis reaction as well as by complement deviation. Seventy-three of these were negative and of the remainder there was a satisfactory agreement in the results. In the case of 7 sera, however, agglutination or lysis occurred in dilutions of 1 : 30 and 1 : 100 whilst the complement tests were negative. None of these cases turned out to be Weil's disease.

The advantages of the complement fixation test over agglutination and lysis are mainly the fact that it can be performed by anyone accustomed to the Wassermann reaction ; the antigen is completely innocuous ; and there is an absence of the slightly positive tests that may lead to incorrect conclusions.

E. H.

RAT-BITE FEVER.

WANSON (M.). Au sujet d'un cas de sodoku atypique observé au Congo Belge. [**An Atypical Case of Rat-Bite Fever in the Belgian Congo.**]*—Ann. Soc. Belge de Méd. Trop.* 1936. June 30. Vol. 16. No. 2. pp. 289-290.

The patient was bitten by a rat on the front of the left wrist ; the wound healed in a few days, but 15 days after the bite was inflicted the patient had a very painful swelling over the site and epitrochlear adenitis. Repeated examination of the blood yielded no spirilla, but a few were found in fluid obtained by puncture of the gland. Neosalvarsan brought about a rapid cure. The author records the case, first because he knows of no previous one in the Belgian Congo ; second, because at no time was there any rash seen, though the case was under observation for 18 days and the course of the fever was typical.

H. H. S.

RAMOND (Louis). Fièvre par morsure de rat "Sodoku." [**Rat-Bite Fever.**]*—Presse Méd.* 1936. Mar. 7. Vol. 44. No. 20. pp. 393-394.

A description of the clinical history of a case of sodoku, in which febrile symptoms developed only 4 days after the patient was bitten by a rat.

E. Hindle.

SAIM (A.). Un cas de sodoku. [**A Case of Sodoku.**].—*Bull. et Mém. Soc. Méd. Hôpit. de Bucarest.* 1936. Oct. Vol. 18. No. 8. pp. 235-237.

The description of the case of a patient who showed clinical symptoms of sodoku after being bitten by a rat. Parasites were not found, but the symptoms disappeared after injections of novarsenobenzol.

E. H.

IVER (M. A. Krishna). **Spirillum Fever caused by a Monkey Bite.**—*Indian Med. Gaz.* 1936. Aug. Vol. 71. No. 8. pp. 462-463.

A monkey ran "amok" and bit 22 persons of whom two developed a clinical condition exactly like rat-bite fever. The causative organism was not isolated, but the symptoms disappeared after treatment with neosalvarsan.

E. H.

FRANCIS (Edward). **Rat-Bite Fever Spirochetes in Naturally Infected White Mice, *Mus musculus*.**—*Public Health Rep.* 1936. July 17. Vol. 51. No. 29. pp. 976-977.

The author calls attention to the fact that white mice may be naturally infected with *Spirillum minus*, and when using them for the diagnosis of rat-bite fever it is important to be sure that the mice are free from such infection, or preferably to use white rats or guineapigs. Examinations were made of the mice supplied to the National Institute of Health [U.S.A.] by 4 dealers. Three of them were supplying mice free from infection, but 45 out of 150 supplied by the fourth dealer showed spirilla in the peripheral circulation.

E. H.

REVIEWS AND NOTICES.

MAXWELL (James L.) [M.D. Lond.]. **Leprosy. A Practical Text-Book for Use in China.**—109 pp. With 31 figs. (1 map). 1937. Shanghai, China: The Chinese Medical Association, 41 Tszepang Road. [4s.]

Dr. Maxwell has had an extensive experience of leprosy in China and has already contributed information on the incidence of the disease in that vast country. This book is intended for workers in China and to bring up to date the recently acquired knowledge of that disease. It commences with a historical account of the disease in China, where it was recognized as early as the sixth century B.C. and chaulmoogra oil was in use five hundred years ago. The chapter on incidence is illustrated by a map showing the highest rates in the Southern and Western provinces and in Shantung in the North-east, without any relation to climatic conditions according to the author. The chapter on aetiology runs on orthodox lines with similar age and sex incidence to other countries.

The symptoms are well described, including the important early stages, and a number of good photos show the lesions in Chinese subjects. The author lays stress on the occurrence of nerve symptoms in all classes of cases.

Under pathology a few illustrations of sections of the skin are given, and lepra reactions are discussed, the author favouring their allergic nature in accordance with the views of WADE and RODRIGUEZ, and he also considers that the production of slight reactions during treatment with chaulmoogra derivatives, including alepol intravenously, may be beneficial in stationary cases. In diagnosis the importance of the occurrence of nerve signs and finding the lepra bacillus microscopically are stressed. A chapter on types and classification follows the Philippine Conference suggestions, but it is pointed out that the portion based on microscopical characters of the lesions is not a practical one for such countries as China.

Under treatment the author is in agreement with E. MUIR, who is often quoted, in placing attention to the general health and removal of complicating diseases in the first place, to this he adds a good diet including adequate amounts of vitamins, such as can best be provided in China by soya bean and pea-nuts, and he urges the importance of calcium. He recognizes that chaulmoogra oil preparations form the best medicinal treatment by intradermal and other methods of administration, and also stresses their value in suitable early cases. After a short chapter on the difficult subject of prognosis, he concludes with an interesting one on Village clinics and Leper settlements, and urges the widespread use of the former in rural areas, where most leprosy originates, as the cheapest and most efficient prophylactic method. All through this small work the author reveals a clear grip of the subject, independent observation and facing of all the difficulties the disease presents.

L. Rogers.

LA FACE (Lidia). **Fauna anofelinica delle colonie italiane.** [Anopheline Fauna of the Italian Colonies.]—*Riv. di Parassit.* Rome. 1937. Jan. Vol. 1. Suppl. Monogr. No. 1. 120 pp. With 29 plates. [73 refs.]

The value of this work to those who are not Italians is considerable, for it provides a full review of published information about the *Anopheles* of Italy's colonial empire, which falls into two groups, here distinguished as Libia and the East African possessions. For several of these countries it has been difficult for the ordinary person to obtain much information, particularly for such remote spots as Kufra and the Fezzan. The reader will observe with surprise that four species of *Anopheles*, including *A. superpictus*, have been collected in the Fezzan. All records are critically discussed, and several which are clearly based on erroneous identifications are rejected. The work appears to be thoroughly up to date in that it mentions species which have only recently been distinguished, and which are at present known only from other parts of Africa. It seems clear that in Italian East Africa, as elsewhere, the group of species resembling *A. funestus* will require much further study.

The rest of the monograph will no doubt prove valuable in the field, though it has no great interest for the general reader. In it the author summarizes the anatomy and classification of *Anopheles* and reviews the species which come on her list, treating some of them extremely shortly. Very little attention is given to biology or to the control of malaria. The bibliography might perhaps have had greater value if it had included more of the work which has been published on the mosquitoes of Tunis, Algeria, Palestine, etc. P. A. Buxton.

SWYNNERTON (C. F. M.) [Director, Tsetse Research Department, Tanganyika Territory]. **The Tsetse Flies of East Africa. A First Study of their Ecology, with a View to their Control.** With a Preface by the Right Hon. W. Ormsby-Gore, M.P., Secretary of State for the Colonies.—*Trans. Roy. Entom. Soc. of London.* 1936. Nov. Vol. 84. pp. xxxvi + 579. With 33 figs., 22 plates & 7 maps. [£5 10s. 0d.]

Mr. Swynnerton's book is prefaced by the Secretary of State for the Colonies, Mr. Ormsby-Gore, who calls attention to the general importance of what has been done, and makes fitting reference to the author's labours.

The body of the work deals with *Glossina* in Tanganyika Territory, much information being included about East Africa generally: indeed, relevant facts from West African sources have also been summarized, particularly where they relate to the widely distributed *G. morsitans*. For the most part the book is a summary, but it appears to contain some not yet published material about *G. morsitans* and *G. swynnertoni*. The first section of the text deals with matters of organization. After giving a brief survey of the general problem of infestation by *Glossina*, the author describes the gradual organization of his staff and the progress from the original survey to the time when reclamation as well as study became possible. One observes that the period of study lasted for roughly ten years, and that reclamation was seriously undertaken from 1931; but it is not clear whether reclamation then became possible

because of the progress of studies or because a large sum became available from the Colonial Development Fund. The author is, perhaps naturally, not very informative on the general question as to whether tsetse research should be carried out independently or attached to the medical or veterinary department of an African administration. The work is limited to the insects, little information being given about the local relation between fly and human or veterinary trypanosomiasis.

The author then gives a very full account of plant and animal communities in East Africa and of the species of fly which is characteristic of each of them. He then takes each species and discusses its biology in detail; these sections are very full, *G. morsitans* receiving 27 pages. Next follows an account of laboratory experiments, many of them carried out in West Africa, in which flies are kept subjected to controlled conditions of temperature and humidity. The author sees the value of such experiments, though fully aware of their artificial nature, and gives a critical discussion of their place in relation to field observations and to control. He then passes on to a full account of the food of *Glossina* in nature, a subject closely related to the control of game. This is followed by an account of natural enemies. Experiments on actual methods of killing *Glossina* form the subject of the next section of the work; there are a number of direct methods, such as the use of parasites, of hand catching, and of traps for adults and pupae, but the majority of the methods are indirect. Among them are mentioned the modification of woody vegetation so that it ceases to be attractive, or useful, to the fly. Here the author emphasizes the view that the wholesale clearing of thickets is not generally necessary, and that, indeed, it is often bad practice, for it is expensive and needlessly destructive. The view is put forward that clearing should be extremely localized, and also that it should be discriminative, being based on an exact knowledge of what the fly requires and of what are the least possible modifications that must be made in the environment. Clearing, however carefully carried out, requires to be supported by other measures; for instance, by proper timing of grass fires, or in other places by refraining entirely from burning the grass. Another indirect attack on fly is by way of the game; here also the author's point of view is critical and judicial. He admits that there are circumstances under which the killing of game may be valuable, but he states clearly that the value would be greater if we had a more precise knowledge of the game as a host for the fly.

Later sections of the work deal with practical matters. An account is given of methods of survey, including the use of air photography, and this is illustrated by a number of remarkable plates which show the distribution of the main types of vegetation on large areas of ground. The author also deals fully with the matter of reclamation. He remarks that Tanganyika has almost certainly spent more money on the study of control of *Glossina* than any other territory, and that it is relevant to ask what practical results have been obtained. The answer is set out in tables showing the areas cleared and the cost of the work. The reader is also given the history of the areas for several years after clearing. The author is able to record that successful work has been carried out which has stood the test of time, so that he and his colleagues may surely be congratulated on their achievements in that difficult sphere, where research leads on to practical measures in the field. The question of reclamation is particularly complex, because it is bound up

with the agricultural practice, anthropological and economic difficulties in human settlements, and the danger of erosion.

Lest the reader should think mistakenly that Mr. Swynnerton's book is a light one, it should be put on record that it contains 66 numerical tables in the text, 10 appendices and 22 plates and 7 large maps. Among the appendices we welcome particularly Dr. C. H. N. Jackson's account of the method by which he estimates the actual density of populations of *Glossina* in the field. This represents a great advance in the direction of precise quantitative work, for it is now possible to estimate the number of mature male flies in an area, though we cannot yet get any figure for the total number of flies of all ages and both sexes. We have already referred to the plates which show air photographs of different types of vegetation. The plate which shows the distribution of *Glossina* in Africa is perhaps a little imperfect in the north of Nigeria and the Gold Coast. The majority of the maps deal with distribution of vegetation, flies and reclamation. The last gives broadly the distribution of game animals in Tanganyika.

Mr. Swynnerton's book is hardly one which could be read in order to obtain a connected account of the subject. It might perhaps best be described as a large collection of facts and views, among which the reader might find what he required by referring to an elaborate table of contents which occupies 26 pages. We count it as a merit that the author is not dogmatic in his views and conclusions, and if the reader finds that the work is not very coherent he cannot blame the author alone, for it must be remembered that the subject is at present only partly developed. No one except Mr. Swynnerton could have produced so general an account of the natural history of tsetse flies in East Africa. Our thanks are due, not only to him and his colleagues, but also to the Royal Entomological Society of London, which has published this book with the assistance of a grant from public funds.

P. A. Buxton.

MARTINDALE. The Extra Pharmacopoeia. Twenty-First Edition, in Two Volumes. Vol. 1. pp. xxxiv + 1182. 1936. London: The Pharmaceutical Press, Bloomsbury Square, W.C.1. [27s. 6d.]

For well over fifty years the "Extra Pharmacopoeia of Martindale and Westcott" has proved itself an essential source of reference on medicinal and pharmaceutical substances used in the treatment of disease. Following the death in 1933 of Dr. William Harrison Martindale, son of the William Martindale who first produced the "Extra Pharmacopoeia" in 1883, the responsibility for its continued production was assumed by the Council of the Pharmaceutical Society of Great Britain and, by their direction, volume I of the twenty-first edition now appears under the editorship of Mr. C. E. Corfield, who is also the editor of the British Pharmaceutical Codex.

This new edition has been completely revised, a large proportion of the material in it has been re-arranged and rewritten, and some out-of-date matter has been deleted to make room for useful accounts of the many new substances or modern applications that have been introduced since the previous edition appeared in 1932. Evidence of careful and thorough revision can be found throughout the volume; for example, in the much expanded notes on the use of totaquina,

plasmoquine and atebirin in malaria, and in the note on atebirin musonate, where reference is made to untoward effects, such as psychoses.

The major part of the volume is occupied by the *materia medica* alphabetically arranged, followed by sections relating to vaccines and sera, toxins and antitoxins, and to poisons and dangerous drugs. With its improved typography, its slightly larger format, and its carefully revised text and indices, this volume may justly claim "to continue to meet the need in medicine and in pharmacy of a comprehensive summary of the composition and application of the multitude of old and new, official and proprietary substances about which the doctor or the pharmacist may require information." *R. L. S.*

TROPICAL DISEASES BULLETIN.

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MALARIA.

STRICKLAND (C.). **The Foundations of Antimalarial Work.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 369-378. With 5 text figs. & 5 figs. on 2 plates.

This is an interesting discussion of the processes of erosion or degradation and accretion that are continually taking place wherever water flows over the land. The complications inseparable from the study of these phenomena are lucidly described. The subject is of more theoretical than practical importance. "It is unfortunate then that while water action is the most important agent in the creation of the face of the land, the points of evidence that would seem to be available for indicating the antithetic tracts of accretion and degradation, the delta and the paradelta, arc, except at the poles of the hydrographic system, equivocal."

Norman White.

WILLIAMSON (K. B.). **The Soil in Relation to Malaria.**—7 pp. [23 refs.] 1936. League of Nations, Eastern Bureau, Singapore.

An interesting and suggestive dissertation the scope of which is indicated by the following extracts:—

"... the relation of soil to malaria is the biggest outstanding ecological problem with which malariology is faced. Its practical significance is increased by the probability... that the power of potential vectors to transmit malaria may be abolished by an accumulation of organic nitrogen in the soil through agricultural or other agency which is less than is needed to abolish the mosquitoes concerned, and is therefore easier and cheaper to produce. The probable direct effect upon both the incidence (specific anopheline potential) and the vectorial potency (infective potential) of vectors, of the enrichment of the soil accompanying 'bonification' has curiously escaped general recognition.

"... The possibility of yet unrecognized races of individual anopheline species found in the tropics, analogous to those of *A. maculipennis* in Europe, which may prove to differ among themselves both in ecological adaptation and in vectorial power, poses the question whether the latter is primarily determined by environmental or by fixed hereditary factors (genes). These two phenomena are unlikely to be independent of one another; and the present writer has put forward the view that the character of the food, both larval and adult, to which a species or race has been habituated for long periods, must influence its physiological constitution and vectorial power: and further that general purity of larval food"... has "determined their ability to serve as intermediate hosts of blood parasites.... Upon this view, other things being the same, anopheline

mosquitoes should be best adapted for transmitting malaria when their larval food and general environment, as well as the drinking water of the adults, are least contaminated with bacteria, especially putrefactive bacteria and their products, which are absent from blood." N. W.

PAMPANA (E. J.). **Anophelism without Malaria.**—*Malayan Med. Jl.* 1936. Dec. Vol. 11. No. 4. pp. 214–222. With 1 fig.

This is a lecture delivered before the International Course of Malariology at Singapore. It is an extremely interesting historical account of researches that have, during recent years, thrown a good deal of light on certain aspects of the problems presented by anophelism without malaria. For the most part the lecture is concerned with the work done in Italy and in Holland on the differentiation of the different varieties of *A. maculipennis*. Though the knowledge so gained may not have explained the phenomenon of anophelism without malaria everywhere in Europe it has gone a long way towards doing so.

N. W.

HONG KONG. REPORT OF THE DIRECTOR OF MEDICAL AND SANITARY SERVICES FOR THE YEAR 1935 [WELLINGTON (A. R.)]. Appendix B. pp. 122–172. With 2 folding maps.—**Annual Report of the Work of the Malaria Bureau for the Year 1935** [JACKSON (R. B.), Malariologist].

Malaria is no longer the important cause of morbidity and death in Hong Kong that it was in the early years of the Colony. In 1935, 400 deaths were ascribed to malaria, a death rate of 0.41 per mille, 1.8 per cent. of the total deaths. Though malaria has practically disappeared from the populous districts of Victoria and Kowloon, it is still prevalent on the outskirts of the City, in the rural areas of the Island and on the mainland and necessitates vigilance. The Malaria Bureau has therefore a useful function to fulfil and the report under review shows that full advantage was taken of the opportunities offered. Investigations concerning the local anophelines were continued with special reference to their relative importance as vectors of infection.

Anophelines breeding in hilly country are responsible for nearly all the indigenous malaria. Of the 43,087 larvae identified 15,901 were *hyrcanus* var. *sinensis*, 15,095 *maculatus*, 5,621 *minimus*, 5,227 *jeyporiensis*, 549 *aikenii* var. *bengaliensis*, 420 *karwari*, 182 *splendidus*, and 92 *vagus*. Adults of *tesselatus* were found but no larvae. In morning catches of adults in human habitations *minimus* and *jeyporiensis* var. *candidiensis* were predominant; *maculatus* which was prevalent in cow byres and pigsties was but rarely caught in human habitations. The two chief vectors of malaria in Hong Kong appear to be *minimus* and *jeyporiensis*: *maculatus*, though a carrier, is of secondary importance; it is markedly zoophilic. Infected specimens of *hyrcanus* and *tesselatus* were also found.

Attention was also given to the local culicines and some interesting observations were made regarding the presence of larval filariae in them and in certain of the anophelines.

An account is given of investigations into the prevalence of malaria in certain areas and of the action taken to diminish the local prevalence of mosquitoes in parts of the territory. The training of inspectors and co-operation with other departments, both military and civil, were not the least important parts of the Bureau's activities in 1935. N. W.

ZIEMANN (Hans). Ueber Kriegsmalaria und Kriegsmalariafolgen [War Malaria and its Results.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 73-90. [47 refs.]

According to a famous saying, war is the father of everything, including malaria. During the world war on the German side 120,781 persons were treated in hospital for malaria, giving a percentage of 19·8 per mille, of these 81·9 per mille were returned to duty fit for service, and only 0·37 per mille died. 1·2 per mille were discharged as unfit for service. In the Chaco war nearly every soldier of the first army corps of the Paraguayan troops suffered from malaria, whilst in the second army corps 60 per cent. were attacked, mostly benign tertian infections. In the recent Abyssinian-Italian war there was little malaria amongst the Italian troops according to Professor Ilvento. The most important points concern :—the diagnosis, malarial parasites in war conditions, the biology of anophelines, as well as the pathology of the disease and the results of mixed infections with other diseases, e.g. tuberculosis. As regards therapy under war conditions, for prophylaxis atebirin is recommended, either 0·05 gm. daily or 0·2 gm. twice weekly. For permanently clearing a malarial area 0·02 gm. plasmoquine twice weekly is recommended with a view to preventing the development of gametes in anophelines. In the war blackwater fever played an important part on account of the liberal use of quinine. Of deaths from all causes amongst the German troops in East Africa, 62·4 per cent. were due to blackwater fever. Amongst the British troops there was a fatality rate of 25-30 per cent. from blackwater fever. The author considers that if malaria is dealt with on the lines laid down by him, future wars will lose many of their terrors.

E. D. W. Greig.

MÜHLENS (P.). Ueber Kriegsmalaria. [War Malaria.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 90-105. [18 refs.]

According to the literature and the author's experience, the possibility of a long latent period and parasitic relapses after ten years must be admitted in the case of the quartan infection. Therefore it is our duty in suspected cases of infection contracted in the world war to investigate very thoroughly such quartan infections, although the author has not met with a single case in the course of his work in the Hamburg Tropical Institute. As regards malignant tertian infections, in the course of his 35 years' experience he has not met with a single case 5 years after the primary infection, which had not been exposed to fresh infection in the interval. The same applies to benign tertian infections, although very rarely there may be a prolonged latent period of 1-3 years. He quotes BROUGHTON-ALCOCK, who, as a result of the examination of 50,000 persons who had taken part in the world war, stated that, "I can with certainty assert that malarial parasites in cases of war malaria do not remain in the blood more than 5 years after return home." In regard to damage to organs following an old malarial infection, to establish this it is essential that the presence of a malarial infection should be proved by blood examination. As regards nephritis attributed to old malarial infection, quartan malaria may produce this not infrequently, but the author has not seen amongst the cases of nephritis which he has observed 10-20 years after the war

any which could be proved to be due to malaria. As regards cirrhosis of the liver attributed to malaria contracted during the war, he considers that the first appearance of liver symptoms so long (18 years) after the infection is against rather than in favour of a connexion with malaria.

E. D. W. Greig.

FISCHER (O.). Kriegsmalaria und ihre Folgen. [**War Malaria and its Results.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 105–113. With 9 figs.

The author records his observations on war malaria as seen in cases which came under his observation in the convalescent home for tropical diseases in Tübingen. Six hundred and eleven cases were treated and investigated. In only one of these cases, in 1921, could malaria parasites be demonstrated in the blood, and, on two occasions, in 1922 and 1923, a diagnosis of malaria was arrived at from the clinical symptoms alone (splenomegaly and monocytosis); no parasites were found in the blood. All the others were not malaria; various provocative methods were employed with a view to activating a possible latent infection. Blood preparations which were said to contain malaria parasites, sent with the cases, showed that blood platelets and particularly deposits of stain had been mistaken for parasites, hence the errors in diagnosis. Such conditions as tonsillitis, sinusitis, bronchiectasis, tuberculosis, cystitis (*Bact. coli*), cholecystitis, hepatitis, syphilis, appendicitis, subphrenic abscess, furunculosis, osteomyelitis, haemorrhoids, endocarditis were mistaken for post-war malaria. The author thinks that these do not exhaust the list of diseases which may have been confused with malaria.

E. D. W. Greig.

BENTMANN (E.). Der heutige Stand der Kriegsmalaria im Bereich des Haupt-Versorgungsamts Südwestdeutschland im Vergleich zu dem Stande im Jahre 1929. [**Present Position of War Malaria compared with that of 1929.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 113–117.

The information was collected by the chief office of the administration of South-West Germany. As a result of his investigation the author was able to lay down the following rules:—It is imperative that medical officers, who have occasion to treat persons who have taken part in the war and have had malaria during the war and are said to be still suffering from it, should only diagnose malarial infection if (a) they have observed one or more febrile attacks, (b) blood has been taken during the pyrexia and sent to a recognized institute and a positive result obtained, and (c) the likelihood of other causes of fever has been excluded by thorough clinical investigation.

E. D. W. Greig.

PELTIN (Ch.). Anchetă paludică într'o comună rurală (Năsturelu, județul Teleorman). [**Malaria Investigation in a Rural Commune, Năsturelu, Teleorman Department, Rumania.**]—*Rev. Igienă Socială.* Bucharest. 1936. Nov.–Dec. Vol. 6. Nos. 11–12. pp. 643–650.

The village of Năsturelu lies to the north of the inundated area of the Danube, and has many collections of stagnant water. Inhabitants

number 1,038, and their chief occupation is fishing. Among them in one year 232 cases of malaria occurred, 22.3 per cent. Nine-tenths of the population were examined and the splenic index among the children [up to what age this includes is not stated, but cases are divided into those under 10 years and others, so presumably this means those of 10 years or less] was 45.6 per cent., among adolescents and adults 15 per cent. Measures taken to deal with the disease are: Increase in the sanitary personnel, compulsory treatment, preventive quininization, antilarval measures and propaganda. H. H. S.

EJERCITO (Antonio). Present Orientation in the Control of Malaria in Tropical Countries.—*Monthly Bull. Bureau of Health*. Manila. 1936. Mar. Vol. 16. No. 3. pp. 77-87.

This paper is of little more than local interest. By far the most important vector of malaria in the Philippines is *A. minimus* var. *flavivirostris*. The author advocates "biological or naturalistic methods to control malaria in the Philippines." He has been successful in effecting a marked reduction in the breeding of *A. minimus* by the conversion of a stream into a series of pools and small spillway waterfalls by a series of dams; *minimus* does not breed in stagnant water. Flushing has given good results, as has the removal of all obstacles to direct sunlight reaching the breeding place. Reference is made to anti-malaria work in Malaya and in Java, which countries have recently been visited by the author. N. W.

BLACKLOCK (D. B.). Studies in Rural Hygiene in the Tropics. III. Simple Forms of Subsurface Drainage for Anti-Malaria Work.—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 501-510. With 6 figs. on 2 plates.

This is an account of various forms of cheap subsurface drainage now being tried out in India and Malaya, which may be applicable to rural areas in which the usual methods of subsoil drainage are prohibitively costly. Stone drains have been used with success: their construction is cheap if there is a sufficiency of stone within easy reach. Bamboo has been used as a substitute for subsoil drainage pipes. Good results can be obtained by using short lengths obtained by cutting the bamboo close to either side of the septum. The durability of bamboo varies as does the size of the lumen in relation to the outside circumference; these are points that repay study. Percolation pits constructed in stream beds have given good results in tea estates in the north of India. Stick and fascine drains are also described (see this *Bulletin*, 1937, Vol. 34, p. 212). N. W.

BARROWMAN (Barclay). Notes on a Demonstration of Malaria Control.—*Malayan Med. Jl.* 1936. Mar., June & Sept. Vol. 11. Nos. 1, 2 & 3. pp. 6-27; 91-104; 161-177. With 62 figs., 3 maps & 10 charts.

These notes were written for the benefit of students of the League of Nations Malaria Course at Singapore who were privileged to attend the author's demonstration of malaria control in Selangor. It is well that they should have been made available to a wider circle of malaria workers by publication in a medical journal. The author succeeded

Malcolm WATSON whose work in Selangor is known to all. His story of the conquest of those three virulent carriers of malaria, *A. umbrosus*, *A. sundaicus*, and *A. maculatus*, is likewise familiar, but it is a story that is well worth retelling, and in Parts I and II of this paper the story is well retold and brought up to date.

Part III is concerned with the clinical aspect of malaria control. All cases of malaria on plantations are admitted to hospital: they are given thirty grains of quinine bihydrochloride a day for two days, then four tablets of atebirin a day for four days. The relapse rate with this treatment has been only nine per cent. In one isolated estate where there is no mosquito control, in which *A. umbrosus* is the vector and which was one hundred per cent. malarious, remarkable results were obtained with plasmoquine. Quinine bihydrochloride, seven and a half grains, with 0.005 gm. of plasmoquine was given twice daily for 14 days in each three months. For twenty months thereafter no clinical case of malaria occurred.

The paper ends with a summary of the results achieved by the various methods employed and an interesting discussion of the cost of malaria control on the group of estates concerned. The author's experience of the control of malaria fully justifies his claim that "practical elimination is not too high a standard at which to aim." N. W.

CRAIG (W. J. F.). Anti-Malaria Drainage Work in the New Changi Cantonment.—*Jl. Roy. Army Med. Corps.* 1937. Jan. & Feb. Vol. 68. Nos. 1 & 2. pp. 15-26; 73-85. With 9 figs.

GRUNSKÉ (F.). Ergebnisse und Erfahrungen der Malaria-Untersuchungsstation in Emden (Ostfriesland) von 1910-1933. [**Results of Experiences at the Malaria Investigation Station at Emden from 1910 to 1933.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 117-124. With 5 figs.

In all 74,199 investigations were made and only 15,865 gave positive results. The population of the town and country in general was not equally attacked by the endemic disease neither in regard to place nor season. It was characterized by localized occurrence in certain areas; after a long time the malaria died out in these areas and flared up in other districts, but it appeared after a shorter or longer interval in the old malarial foci again. Under favourable temperature conditions, over 16°C., malaria may take on an epidemic character, appearing simultaneously in many districts, but this only occurs when there are numerous parasite carriers and chronic cases in the stricken villages. A noteworthy feature is that during the past 25 years the endemic foci of malaria have shown no inclination to extend to the rest of North-West Germany, even under the favourable conditions of 1917. During the world war there was an enormous increase in the number of cases, the peak being reached in 1918, in 1919 there was a rapid fall in the number of cases, the lowest point was reached in 1929.

E. D. W. Greig.

RUSSELL (Paul F.). **Malaria in India. Impressions from a Tour.**—*Amer. Jl. Trop. Med.* 1936. Nov. Vol. 16. No. 6. pp. 653-664.

The impressions of an expert observer, culled during a visit to a country unknown to him, generally make interesting reading. Dr. Russell's impressions, read to the American Society of Tropical

Medicine, are no exception. The complexity and magnitude of the malaria problem of British India were thoroughly appreciated. The many-sided nature of the problem is illustrated by brief descriptions of malaria conditions in Bombay City, Bengal Presidency, and Assam.

The author realises that in the rural parts of India, in which 90 per cent. of the population live, it is not feasible at present, for economic reasons, to control malaria by any known method. Many will also agree with him that in places where adequate control is feasible—cities, towns, pilgrim centres, industrial enterprises and the like—more might have been done than has been accomplished. Appreciative reference is made to the importance of India's contribution to malariology.

N. W.

SIMITCH (Tcheda). Etudes sur la malaria dans la Serbie du Sud, Banovine du Vardar. [**Malaria in the Vardar Province, Southern Serbia.**]*—Bull. Office Internat. d'Hyg. Publique.* 1936. Sept. Vol. 28. No. 9. pp. 1690–1734. With 1 chart & 1 map.

This report by the Director of the Skoplie Institute of Hygiene deals with the prevalence of malaria in the southern part of Serbia. It is based on the cases of malaria that have been observed in Skoplie during nine years, 1927–1935. Avoidance of repetition and considerable condensation would have added to the interest of the report and made it more readable.

The geographical features of the district and its climate are adequately described. Five anophelines are found, *maculipennis*, *superpictus*, *bifurcatus*, *sinensis* and *nigripes*: the three last-named play no rôle of importance in the local transmission of malaria. *A. maculipennis* prevails throughout the province; *superpictus* is confined to those portions of the southern part of the area where flowing water is available for its breeding. In certain areas rice fields are of importance in the propagation of *maculipennis*. *A. maculipennis* var. *messeae* and *maculipennis* var. *maculipennis* are both found in varying proportions from place to place, season to season, and year to year.

P. vivax, *falciparum* and *malariae* all occur: quartan fever is rare. *P. falciparum* becomes increasingly prevalent the further one travels south: in the north of the province it is relatively rare. As in other Balkan countries the great majority of cases that occur in the first half of the year are *vivax* infections; there is every year a marked rise in the number of cases in the month of May. In two years out of the nine there were, indeed, more cases of benign tertian fever in May than in any other month of the year. As the period of active transmission only begins in the middle of May the great majority of these cases must be either relapses or primary cases infected the previous year, with prolonged periods of incubation.

Malignant tertian makes its appearance, as elsewhere in the Balkans, in the second half of July. This form of malaria rarely accounts for more than a third of the total cases of malaria in Southern Serbia, though in exceptional years the number of cases may exceed that of benign tertian.

N. W.

MARGOLIT (D.). **Malaria among the Arabs.**—*Harefuah.* 1936. Dec. Vol. 11. No. 12 (66). [In Hebrew. English summary p. 2.]

This is an attempt to estimate from cases attending his private clinic the relative prevalence of the different malaria infections. Of

1,221 malaria patients seen by the author in the past 3 years children made 60 per cent. ; more than one-fifth, 232 or 21·5 per cent., of the cases occurred in August, which is the month of greatest prevalence, and only a small percentage, 6·2, suffer from *P. falciparum* infection. The Public Health Department wage war against Anopheles and their breeding places, but the Southern Beduins are constantly reintroducing infection at the Sharon and they must be thoroughly treated if the best results are to be attained. H. H. S.

MADWAR (S.). **A Preliminary Note on Anopheles pharoensis in Relation to Malaria in Egypt.**—*Jl. Egyptian Med. Assoc.* 1936. Oct. Vol. 19. No. 10. pp. 616-617.

During an outbreak of malaria at Gabel El Asfar in July 1936, one hundred and thirty eight *A. pharoensis* were dissected. Oöcysts were found in 19, sporozoites in the salivary glands in two. N. W.

MENNONNA (Gerardo). Contributo alla conoscenza della malaria somala risultati degli accertamenti microscopici. [**Prevalence of Malaria in Somalia as seen by Microscopical Examinations.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Nov. Vol. 17. No. 11. pp. 678-683.

It is stated by the author that speaking for Somalia as a whole benign tertian and subtertian infections are about equal, quartan very few, but that a study of local prevalences shows that the relative numbers are very variable. An aggregate of 17 small localities, where only a few examinations were made, gave a total of 525 positive, of which 327 (63·3 per cent.) were *P. vivax*, 187 (35·6) *P. falciparum* and 11 (2·1) *P. malariae*. In Magodiscio the first two were nearly equal: of 486 positive 222 (45·7 per cent.) were *P. vivax* and 243 (50 per cent.) *P. falciparum*, but in Villabruzzi the subtertian vastly predominated. Of 3,084 positive 2,777, or 90 per cent., were *P. falciparum* infections, 187 (6·1) *P. vivax* and 120 (3·9) *P. malariae*. A mixture of infections, *P. vivax* and *P. falciparum*, was infrequent. H. H. S.

ROSE (G.) & WANG (B. L.). Beobachtungen aus 7 Jahren ueber das Vorkommen von Malaria tertiana, Malaria tropica und Malaria quartana in Hangchow und einigen anderen Plätzen Chekiangs. [**Seven Years' Observations on Malaria in Hangchow.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 130-153. With 7 figs. [10 refs.]

The results were based on 20,480 blood examinations of cases suspected to be infected with malaria. Of these, parasites were found in 4,403 and 16,077 were negative as regards parasites. Of the 4,403 positives the species of parasite could not be precisely determined in 355 thus leaving 4,048 only; of these, 2,345 were cases of infection with *P. vivax*, 1,161 with *P. falciparum* and 542 with *P. malariae*. The benign tertian malaria case curve in Hangchow shows yearly two peaks, the first in July the second in the autumn months. The malignant tertian malaria curve of cases shows the same double peak; in 1935 there was an extraordinary rise in the number of cases of malignant tertian infections, the curve was in this year also different in shape, the double peak was absent, there being no remission as usual in August, instead a steady increase took place. As regards quartan infections, they consider that the number is greatly underestimated in

China because the cases seldom come for medical treatment. Four species of anophelines are present in Hangchow, *A. hyrcanus* var. *sinensis*, *A. aiikeni*, *A. lindesayi* and *A. minimus*. In the whole of China 24 species of anophelines are known. All 4 species in Hangchow are important carriers of malaria, according to the sporozoite and oöcyst index. The normal rise of the high summer temperature in Hangchow produces unfavourable conditions for the life of the mosquitoes, the diminution of the relative humidity has the same effect. The abnormal summers of 1934 and 1935 produced alterations in the malaria curves, in the former the temperature was high and moisture low, and the case curve showed a well marked remission in August, but in the latter the summer was cool and the relative humidity high and, as already stated, there was a marked increase of malaria with no remission in August. A series of graphs illustrates the course of the malaria.

E. D. W. Greig.

GASCHEN (H.) & MARNEFFE (H.). Infection naturelle de *A. hyrcanus* var. *sinensis* dans le delta du Fleuve Rouge. [Natural Infection of *A. sinensis* in the Red River Delta.]—*Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 970-975. [24 refs.]

In the deltaic country of Tonking malaria is present but its endemicity is low; from time to time localized epidemic outbreaks occur. Until recently no infected anophelines had been found there: *A. aconitus* was generally suspected to be the chief vector. During a recent epidemic in Binh-Ha in the middle of the delta eight *A. sinensis* out of 163 dissected were found to be infected. Other species captured included *vagus*, *aconitus*, *tesselatus*, *barbirostris*, and *hyrcanus* var. *nigerrimus*; none of these was found infected. This observation is of considerable local importance as *A. sinensis* is very widespread. Hitherto it has been regarded as a vector of very secondary importance in French Indo-China though infected specimens have been found.

N. W.

GASCHEN (H.). Contribution à l'étude de l'infection naturelle des anophèles au Tonkin. [Natural Infection of Anophelines in Tonking.]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1093-1095.

An outbreak of malaria in a village in the Delta of the Red River, Tonking, is reported in which *A. hyrcanus* var. *sinensis* was the chief vector. A similar experience in a village 14 kilometres away was recently recorded (see above). Previously this species was regarded as relatively harmless in Indo-China. During the outbreak now recorded one *A. tessellatus* and one *A. hyrcanus* var. *nigerrimus* were found with salivary gland infections. Neither species is sufficiently prevalent to make it at all likely that they will prove to be vectors of importance, but the observation is of interest.

N. W.

PATIÑO CAMARGO (Luis). Informe acerca de la epidemia de paludismo de Cambao. (Enero de 1936.) [Outbreak of Malaria in the District of Cambao (Colombia).]—*Rev. de Higiene.* Bogota. 1936. Jan. & Feb. Vol. 17. No. 1. pp. 5-18.

In the last week of 1935 and the first of 1936 disease broke out in Cambao and assumed an epidemic character. The poorer people

were most attacked, of all ages and either sex. In the middle of the second week when a Commission arrived to investigate, some 70 cases had already occurred and in the first week of January four died. Blood smears were examined for malaria or other parasites, samples of blood were taken for the yellow fever protection test, and haemocultures made. The total population is not stated, but of 54 blood slide specimens examined 19 were positive for malaria, 15 showing *P. vivax*, 3 *P. falciparum*, and one both. Blood cultures all proved sterile. Seventy-seven samples to be tested for yellow fever have not yet been reported upon [at all events no mention is made of the results in this paper]. Anopheles are abundant; Aedes were plentiful in the houses and the adjuncts, in 83 per cent. larvae were found and Aedes predominated. H. H. S.

LIMA (J. de Araujo). Constante endêmica da região do Gurupy. [Nosology of Gurupy].—*Brasil-Médico*. 1936. May 9. Vol. 50. No. 19. pp. 398-405. With 1 map.

Gurupy is situated near the coast to the north of Maranhão State; it lies low, and the climate is humid, with two rivers, the Gurupy and the Piriá. The populations of the various villages in the district are given. The chief diseases are malaria and helminthiasis. Nearly one-third, 31·1 per cent., suffer from malaria and 86·3 per cent. harbour worms of some kind. Malaria prevalence is greatest in June-August, the transition period from winter to summer when countless breeding pools for mosquitoes are present after the torrential rains. Benign tertian is far the commonest form, subtertian is rare and quartan very occasionally seen. Measures directed to getting rid of breeding sites were deemed impracticable, so treatment of the people was taken in hand, by means of atabrin and plasmoquine. For this to be carried out efficiently, there is need for 3 sanitary posts to be established in the municipality of Vizeu, at which large stocks of the drugs are to be kept. [The malaria question only is dealt with in this article, that of helminthic infestation will probably be considered later.] H. H. S.

CORRÊA (Renato). Informações sobre a malária na colônia japonesa de Tietê. (Estação de Lussanvira.) [Malaria in the Japanese Colony of Tietê, Brazil].—*Ann. Paulist. Med. e Cirurg.* 1936. Aug. Vol. 32. No. 2. pp. 131-142. With 4 figs.

An interesting informative account of living conditions in the Japanese agricultural settlement of Tietê, Brazil. The settlement has a population of 5,346, all but some 200 being Japanese immigrants. There was a relatively severe outbreak of malaria in 1935, 11·7 per cent. of the population being attacked. The disease is much less in evidence this year. The most important vector is *A. albitarsis*. N. W.

HODGKIN (E. P.) & JOHNSTON (R. S.). Malaria at Batu Gajah, Perak: transmitted by *Anopheles barbirostris* Van der Wulp.—*Bull. Inst. Med. Res. Federated Malay States*. 1935. No. 1. 19 pp. With 1 folding plan, 1 chart & 3 figs. on 2 plates.

Though individual specimens of *A. barbirostris* have previously been found infected in Malaya and in Sumatra this is the first report of that mosquito being the chief malaria vector in an endemic centre in Malaya.

Batu Gajah is a township with a population of 6,759 in the tin-bearing valley of the Kinta River some fifty miles from its mouth. Unbroken overgrown swamps extend for two miles to the west of the town. These swamps are the chief source of the large and varied anopheline fauna. The breeding of *A. maculatus* and other stream breeders has been controlled and until recently there was but little malaria in Batu Gajah. Since 1929 the incidence of malaria has increased considerably: in 1934 the fresh malaria cases amounted to 2.5 per cent. of the population.

The anophelines found included *aconitus*, *annularis*, *barbirostris*, *hyrcanus* var. *nigerrimus*, *hyrcanus* var. *sinensis*, *philippinensis*, *subpictus* var. *malayensis* and *vagus*. In 1933 of 914 *barbirostris* caught in the town and dissected 26 were found infected. In 1934 seven out of 667 were infected. The only other infected anophelines found out of large numbers dissected were a single specimen of each of the two varieties of *hyrcanus*. *A. aconitus* was very prevalent but none was found infected.

The proportion of *barbirostris* larvae found was small when compared with the number of adults captured. This is probably explained by the inaccessible nature of its chief breeding places in overgrown swamps which were difficult to approach even by boat. In 1934, *barbirostris* formed 31 per cent. of the adult anophelines captured but only 5 per cent. of the anopheline larvae found.

The measures now being taken to deal with the problem include the filling of swamps by pumping sand from the river bed by means of a suction dredger.

N. W.

GREWAL (R. S.). **Spleen Index and Other Malarial Problems of Remote Villages along the Arakan Coast of Burma.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 379–382.

The main interest of this brief note lies in the fact that very little is known of the health conditions of the not easily accessible villages situated along the Arakan Coast of Burma. The country is very hilly and thickly wooded; modern facilities of communication are non-existent. The annual rainfall varies between 170 and 250 inches. Villages are situated on the sandy sea-shore or at the foot of the hills. The author visited eleven villages in which he examined 1,541 children for enlargement of spleen. The spleen index was 11.5. In one village at the foot of the hills 24 of 28 children had enlarged spleens. No collection of anophelines was made and it was only possible to obtain nine blood films. Six films contained parasites, five *P. vivax* and one a mixed infection, *vivax* and *falciparum*.

N. W.

FENG (Lan-Chou). **Malaria and its Transmission in Kwangsi, China.**—*Chinese Med. Jl.* 1936. Dec. Vol. 50. No. 12. pp. 1799–1814. With 1 map & 8 figs. on 4 plates. [10 refs.]

This is an account of a six weeks' tour of inspection in the Province of Kwangsi during which the author made observations on the prevalence of malaria and of anopheline mosquitoes in thirteen places representative of the different geographical conditions to be found in this Province. The report derives interest from the fact that nothing hitherto has been published regarding malaria in Kwangsi, which province lies immediately to the north of Tonking and to the east of Yunnan. The north-west part of the province is mountainous, the middle generally flat and dry, the eastern part flat and wet. In each

place visited a number of children were examined for splenic enlargement, blood smears were examined and a search made for mosquitoes, both larval and adult.

Malaria is widely but unevenly distributed. Endemic malaria is most severe in the mountainous regions. Nine species of anophelines were identified, *minimus*, *jeyporiensis* var. *candidiensis*, *hyrcanus* var. *sinensis*, *maculatus*, *splendidus*, *annularis*, *kochi*, *vagus*, and *lindesayi*. In places where malaria is endemic, *minimus* and *jeyporiensis*, one or both, are in evidence. These two species appear to be the most important vectors. *A. sinensis* appears to be the most prevalent Anopheline and though the author found one specimen exhibiting oöcysts on the stomach he would appear to be justified in concluding that it plays no important part in the transmission of malaria.

Vivax infections were more in evidence than *falciparum* in all the endemic areas. In one village of low endemicity, in which an epidemic of malaria was drawing to a close, *falciparum* was chiefly prevalent. Very few quartan infections were found. N. W.

LING (L. C.), LIU (K. B.) & YAO (Y. T.). **Studies on the So-called Changch'i. Part II. Changch'i in Yunnan.**—*Chinese Med. J.* 1936. Dec. Vol. 50. No. 12. pp. 1815-1828. With 1 map & 8 figs. on 3 plates. [14 refs.]

Changch'i is malaria, chiefly subtertian malaria, according to the authors of this report, though *vivax* infections occur side by side with those of *falciparum*. Changch'i has been the scourge of Yunnan from time immemorial; it has retarded the economic development of a province very rich in mineral resources and is responsible for the backward conditions prevailing. Changch'i is very widespread, prevailing everywhere except in the northern and north-eastern parts of the Province and the territory immediately surrounding Kunming (Yunnanfu) the capital. The indigenous populations ascribe the disease to a variety of causes, toads, eels, butterflies, but most commonly to the inhalation of poisonous gas arising from decaying vegetable matter in the valleys.

The observations described in this report were made during a journey from Kunming to the Burmese border, a distance of 700 miles, which occupied from November 10th to January 24th, 1936. Inquiries were made in 27 places on the way. Parasite indexes varied between 7.6 and 68, spleen indexes between 12 and 100. Near the Burma frontier much quartan fever was observed. The authors have shown beyond question that changch'i in Yunnan is malaria and that the malaria problems of Yunnan are of great importance and complexity. Nine species of anophelines were found:—*hyrcanus* var. *sinensis*, *hyrcanus* var. *nigerrimus*, *philippinensis*, *vagus*, *aikeni*, *minimus*, *maculatus*, *jeyporiensis*, and *barbirostris*. N. W.

GUIDETTI (Carlo). **Geografia medica in rapporto alla malaria nel basso Giuba.**—*Riforma Med.* 1936. Dec. 19. Vol. 52. No. 51. pp. 1731-4, 1737-9, 5 figs. [12 refs.]

RAMSAY (G. C.) & MACDONALD (G.). **The Species Control of Anophelines in India.**—*Indian Med. Gaz.* 1936. Dec. Vol. 71. No. 12. pp. 699-710. With 3 figs. [55 refs.]

It is now generally recognized that in any one part of the world a single species of *Anopheles* is often the only vector of malaria, and

existing knowledge of the biology of this important species permits the field worker to plan effective control. The authors feel it desirable to collect what is known about those species which carry malaria in India. Of the 43 species occurring in India, sporozoites have been found in nature in 12, of which the following 9 are regarded as important and dealt with in the present paper :—*Anopheles minimus*, *fluvialis*, *varuna*, *culicifacies*, *sundaicus*, *stephensi*, *philippinensis*, *annularis*, and *pallidus*.

In order to indicate the scope of the paper, one may select the information which is given about *A. minimus*, a species with which both authors are exceedingly familiar. They summarize what is known about its geographical distribution and importance as a vector. This is followed by information about breeding places in the dry season and the rains, with particular reference to the presence of silt in the water and shade on the land surrounding them. They deal with seasonal abundance in particular relation to low temperatures in the cold weather, feeding habits and abundance in houses. Having summarized these topics they pass to control, based on a precise knowledge of the breeding places, and often attained by shading small streams by planting strips of thick shrubs along the banks; the occasional use of bamboo matting is also dealt with, as is the damming of streams to form a series of small locks provided with sluices. A section on the relation of this insect to the cultivation of rice follows.

The authors discuss certain lines of work which appear to require further study. Throughout the paper the reader perceives clearly how broad have been the enquiries and how many the workers who have made it possible for the sanitarian to advise his measures of control. The paper concludes with a long list of references.

P. A. Buxton.

RICE (E. Milford) & MOHAN (Badri Nath). *A. minimus* in Assam, Its Cold Weather Bionomics and their Relationship to Anti-Larval Control.—*Records of the Malaria Survey of India*. 1936. Dec. Vol. 6. No. 4. pp. 557–594. With 1 graph. [16 refs.]

The questions at issue are whether *Anopheles minimus* continues its normal activities during the cold weather, and whether operations against it should be allowed to cease at that season.

Working in Upper Assam the authors liberated eggs in a floating cage in a stream; they found that all through the cold weather the larvae feed and grow so that even in January the total duration of the aquatic stages was only about 38 days. They describe other observations and experiments which show that the female feeds and deposits fertile eggs in the cold months, and that numbers of adults may be found in nature. It seems then that they have clearly established that though no doubt all vital activities are retarded, the insect does not become inactive at any stage, even in the coldest month, at the place where the work was done. The authors conclude that it is a mistake to regard this mosquito as a species which carries malaria only in the hot months: measures directed against its breeding places should come into operation in January.

The authors are perhaps inclined to attribute too much value to small numbers of observations to which no critical tests for significance have been applied. They describe, for instance, an experiment in which five batches of this insect were bred from the egg between

December and the end of March, from each of which they obtained between 22 and 40 adults; but on this slender evidence they are inclined to suggest that the sex ratio may be affected by temperature. It is also doubtful whether the apparent reduction in the proportion of adults found to contain sporozoites requires any explanation: is it not best accounted for as a sampling error? P. A. B.

CHOWDHURY (K. L.). **Three Years' (1933 to 1935) Malaria Control Work in Calcutta.**—*Records of the Malaria Survey of India*. 1936. Sept. Vol. 6. No. 3. pp. 467–481. With 1 graph & 1 map.

This report describes the work being done by the Calcutta Municipal Corporation to control malaria, and the results obtained. There are three anopheline vectors of malaria in Calcutta, *A. stephensi*, *A. varuna* and *A. sundaicus*; of these *A. stephensi* is by far the most important. In 1932 the spleen index was 1.73 and the parasite index 2.6. In 1935 these indices were 0.84 and 0.64. N. W.

- i. WHITE (R. Senior), LAL (R. B.), ADHIKARI (A. K.) & SWAROOP (Satya). **Some Experiments with an Automatic Mosquito-Catching Machine: the Entoray.**—*Records of the Malaria Survey of India*. 1936. Dec. Vol. 6. No. 4. pp. 595–629.
- ii. WATS (R. C.) & BILDERBECK (C. L.). **Some Experiments with "Entoray" Machine as an Anti-Mosquito Measure.**—*Ibid.* pp. 549–555.

The Entoray is a proprietary apparatus for attracting and killing mosquitoes and other insects. The principle on which it works is that a mercury vapour lamp is intended to attract the insects within the range of an electric fan which sucks them down a pipe and into a box of wire gauze. Advertisements of the machine are extremely familiar to students of malaria, but little or no scientific work on it appears to have been published. The two papers under review describe tests which have been carried out with great care in Calcutta and Bombay, machines having been lent for the purpose by the manufacturer.

i. In a preliminary experiment in Calcutta the machine caught mosquitoes belonging to 26 species; 75 per cent. of the insects being *Culex*, 10 per cent. *Anopheles annularis*, 2.8 per cent. *A. subpictus*; 10 other species of *Anopheles* occurred, all of them rarely.

The authors then stained mosquitoes and released them on an open racecourse at measured distances from the machine. The recoveries were very few; for instance, of 843 *Culex* released at 500 yards, only 6 were recovered. The machine was, incidentally, within 300 yards of several catching stations which had been under regular observation for five years. In this position it was run for two months; the figures, which are recorded in full and analysed in an appendix, do not show any reduction in the number of mosquitoes found in the catching stations. Figures from catching stations elsewhere in Calcutta indicate that the season was a normal one. It seems that those figures must be accepted as disposing of the claim that the machine can reduce the numbers of mosquitoes, even in a limited area.

The authors point out that some such machine as the Entoray may yet prove of great value for purposes of research. With it they have already obtained much new information about the mosquitoes at

Calcutta, in spite of the large amount of work that has already been done by other methods; for instance, the machine collected large numbers of *Anopheles annularis*, a species hardly ever found resting in houses; it also collected specimens of 5 species of mosquitoes previously unknown in Calcutta. On the other hand, it failed to catch any *A. stephensi* in an area in which breeding places of that insect were abundant.

The authors also describe some interesting experiments in which mosquitoes caught during certain periods of the night are recorded separately.

ii. Work carried out in Bombay supports that reported more fully from Calcutta. Large numbers of mosquitoes were stained and released, even so near the machine as 10 yards, but the number of recoveries was very small. On one occasion out of 155 mosquitoes released one only was recovered during the three following nights. During the same period the machine captured 181 unstained mosquitoes. It also collected considerable numbers of other insects, many of them assumed to be beneficial to man. P. A. B.

SICAULT (G.) & MESSERLIN (A.). Note sur la destruction des larves par les naphthes et sur l'activation des mazouts. [**The Destruction of Larvae by Mineral Oils and the Activation of Such Oils.**]—*Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 1023–1032.

Discordant results obtained in the use of various crude oils as mosquito larvicides in Morocco led the authors to undertake the observations described in this paper. They consider that the death of larvae after oiling is not due solely to asphyxia; the toxicity of the oil used plays a preponderating rôle. [In this connexion see this *Bulletin*, 1937, Vol. 34, p. 171.]

Of the various products obtained by the fractional distillation of crude oil the earlier fractions act most rapidly. Among the substances capable of reinforcing the lethal action of heavy oils used as larvicides are the oleoresin of pyrethrum, 0.1 per cent. with gas oil; paradichlorobenzene, 0.5 per cent., and naphthalene 0.25 per cent. The last is now being used by the authors: it is cheap and its use, in the dilution noted, results in the destruction of all larvae in less than an hour and a-half. N. W.

SOKOLOV (N. P.). L'acclimatization du *Gambusia patruelis* en Asie centrale. [**Acclimatization of *Gambusia patruelis* (affinis) in Central Asia.**]—*Riv. di Malarologia.* Sez. I. 1936. Vol. 15. No. 5. pp. 325–344. With 11 figs. [25 refs.]

Gambusia had been acclimatized in most countries of Southern Europe as well as in China, Japan, Siam and elsewhere. It was imported into the U.S.S.R. from Italy and thence all over the country—Transcaucasus, Daghestan, Azov and Black Sea, the Southern Ukraine, Moscow, etc., In 1935 experiments were made to test their antilarval efficacy in rice fields. The fish thrive well and at two years of age were very prolific, and in one season between the time of sowing the rice and its ripening 4–5 generations might be produced. Examination of the stomach contents of the *Gambusia* showed that 32.8 per cent. of the total food of the adults were *Anopheles* larvae, 20 per cent.

Culicides ; among the young forms *Anopheles* larvae constitute nearly double that of adults, *viz.*, 64.8 per cent. [These are the figures given by the author, but it must be noted that the total "per cent." of the food constituents stated in a table is well over 100.] With a stock of 2-3 specimens per sq. metre of the rice-fields 90 per cent. of the *Anopheles* larvae were exterminated, as compared with control fields without *Gambusia*.
H. H. S.

SOKOLOV (N. P.) & CHVALIOVA (M. A.). **Nutrition of *Gambusia affinis* on the Rice Fields of Turkestan.**—*Jl. Animal Ecology*. 1936. Nov. Vol. 5. No. 2. pp. 390-395. With 5 figs. [12 refs.]

The authors have attempted to provide quantitative information about the food of the larvivorous fish *Gambusia* which has been introduced successfully into rice growing districts in Turkestan.

A large number of fish were collected at different dates throughout the summer and at different times of day and the stomach contents were analysed quantitatively. It was found that the most generally distributed type of food was larvae of *Anopheles*, which were present in one-third of the adults and two-thirds of the young fish. Larvae of many other types of aquatic insects were also very frequently encountered. None of the fish had been living on an exclusively vegetable diet, though microscopic plants were found in about 13 per cent. of the adult and small fish. The authors very rightly point out that this type of information, though interesting, gives no clear idea of the value of *Gambusia* as a destroyer of larvae of *Anopheles*. They therefore carried out experiments on the rate at which the fish digests larvae after it has fed upon them in an aquarium at a known temperature, been removed to clean water and killed for examination after a particular interval of time. It was demonstrated that at 30°C. a complete circle of digestion took place in three or four hours, after which time the insect larvae had been completely absorbed or discharged from the stomach, except that chitinous parts might still be found. It appeared that the rate of digestion in adult and young fish was approximately identical.

The abundance of larvae of *Anopheles* was compared in different parts of the rice field, in some of which *Gambusia* was present. In the absence of *Gambusia* about 10-15 *Anopheles* larvae per sq. metre were found in July, the number rising very rapidly through August, and reaching about 90 in early September. In the presence of *Gambusia* the average density of the *Anopheles* larvae was 3.6 per sq. metre, the highest figure observed being 5.2. The authors concluded, therefore, that *Gambusia* exterminated 80-90 per cent. of the larvae.
P. A. B.

PRASHAD (B.) & HORA (S. L.). **A General Review of the Probable Larvivorous Fishes of India.**—*Records of the Malaria Survey of India*. 1936. Dec. Vol. 6. No. 4. pp. 631-648. With 7 plates. [36 refs.]

The contents of this paper are indicated by the title. The authors give a full summary of existing knowledge so far as it relates to India, and then discuss those fish which are known to destroy mosquito larvae or which may be supposed to do so. This part of the paper is illustrated by 30 excellent line drawings.

The paper has considerable general interest, for though its scope is limited to India it is written by zoologists whose point of view is a little different from that of the student of malaria. P. A. B.

MULLIGAN (H. W.) & MAJID (S. Abdul). **Some Notes on the Care, Transportation, and Use of *Gambusia affinis* under Indian Conditions.**—*Records of the Malaria Survey of India*. 1936. Dec. Vol. 6. No. 4. pp. 537-547. With 3 figs. on 1 plate.

As its title implies this paper is of local importance only. In India *Gambusia* has proved a useful adjuvant to other measures of mosquito control in certain conditions. N. W.

COLLIGNON (E.). La campagne antipaludique de 1935 en Algérie (partie orientale du département d'Alger et département de Constantine).—*Arch. Inst. Pasteur d'Algérie*. 1936. Sept. Vol. 14. No. 3. pp. 391-406. With 18 figs. on 9 plates.

SCHÜFFNER (W. A. P.) & ESSEVELD (H.). Bijdrage tot het vraagstuk der perniciositeit van de *Laverania malariae*. [**Observations on the Malignancy of Malignant Malaria.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Nov. 24. Vol. 76. No. 47. pp. 3038-3045. With 2 charts & 4 figs. on 2 plates.

One cause of malignancy in malaria is attributable to differences in the proliferation of the parasite. In the case of benign tertian and quartan, increase of parasites occurs up to a maximum in geometrical progression; then comes a period at which the parasites remain level, for which various reasons have been put forward, such as that in some sporulations no merozoites are viable or that in each sporulating form only one merozoite is fitted to carry on. The parasite graph finally descends, with the development of immune bodies. Contrast this picture with the case of pernicious malaria and its parasite, which is not subject to body influence and may proliferate, in some cases, continuously. This leads to such extensive erythrocyte destruction that death results.

Another cause of malignancy, however, is the tendency of the parasite to develop in the capillaries of internal organs which, when it occurs in the brain, leads to coma and death. How it is that in this affection the parasite-infected erythrocytes come to be fixed in the blood vessels is controversial matter. The authors favour the view that as the plasmodium becomes more mature it develops a tendency to become fixed on the endothelium of the vessels.

The occasion of these observations on the cause of malignancy arose when a blood film, one of a regular series, was received in the laboratory. It showed, under low power examination distinct clumping of erythrocytes. In appearance the clumps were reminiscent of those seen in the estimation of blood groups. These clumps were made up of agglomerated red cells, each of which contained a rather large parasite, and the group was surrounded by non-parasitized erythrocytes. A special enquiry elicited the fact that the patient, whose blood, for the film, was procured during life, died, after temporary improvement, in a state of deep coma. Thus the clumping was not a post-mortem effect. It could scarcely have been general in the

entire circulation or embolism would have been continuous and no temporary improvement would have been shown. Various possibilities are considered for this phenomenon of clumping, which may be very closely related to the cause of the pernicious character of malignant malaria. If this phenomenon was not universal but confined to cutaneous vessels and internal organs, it would explain the clumping shown in a film taken from the skin. Another explanation of the clumping may lie in the formation of agglutinins. No further information is forthcoming in the present instance on the state of the circulating blood which could serve as control on these suppositions and it is desirable that, in the event of such a pernicious case occurring, a special examination should be made of the blood from a large vein or even artery.

W. F. Harvey.

HELMINTHIASIS.

BOLAÑOS (José Ma.), KOURI (Pedro) & ANIDO (Vicente). El parasitismo intestinal en los indigentes del campamento de Tiscornia. [Intestinal Parasitism among the Natives of Tiscornia (Cuba).]—*Rev. Parasit., Clin. y Lab.* Habana. 1936. July-Aug. Vol. 2. No. 4. pp. 601-609.

In 1935 the authors examined 200 Chinese immigrants to determine the degree of intestinal parasitism [see this *Bulletin*, 1936, Vol. 33, p. 558]. They are now undertaking a similar investigation of the indigenous population of Tiscornia. The total population is only 500 and the present article deals with 150 examined up to the present. It seems hardly worth while to publish an interim report on so few, but brief mention may be made of results to date. Of the 150 there were 117 found to be harbouring parasites, 78 per cent. Willis's method was employed. Protozoa were present in 70, helminthic ova in 90 and both in 43. Of the worms *Trichuris* was the most frequent, in 73, *Ascaris* next, 38, *Necator* in 15. Of protozoa *E. coli* was found in 26, *Giardia lamblia* in 25, *Endolimax nana* in 18, *Chilomastix* in 3, *E. histolytica* in 2. H. H. S.

CALVÓ FONSECA (Rafael), KOURÍ (Pedro) & BASNUEVO (José G.). Porcentaje y distribución geográfica del parasitismo intestinal en Cuba. [Intestinal Parasitism in Cuba.]—*Medicina de Hoy.* Habana. 1936. Oct. Vol. 1. No. 9. pp. 393-397.

A small number of individuals, 140 in all, from Bolondrou in Matanzas Province were examined for intestinal parasites [method of examination not stated]. The ages of 15 only are mentioned and these ranged between 1 and 13 years, whether the rest were adults or all were children or adolescents is not known. Briefly, 97 of the 140 (69 per cent.) were positive; 9 had protozoa; 88 had helminths. *Trichuris* was the most frequent, 66 cases, *Ascaris* 34, *Necator* 9, *Enterobius* and *Taenia saginata* each once. *Entamoeba coli* was found in 23, *E. histolytica* and *Giardia lamblia* each 3 times. H. H. S.

DA SILVA (Candido). Infestação por helmintos intestinaes em creanças de idade escolar em Teresina (Piauí). [Helminthic Infestation among School Children in Teresina, Piauí (S. America).]—*Hospital.* Rio de Janeiro. 1936. Nov. 8th Year. Vol. 2. No. 11. pp. 1331-1338. With 2 charts. [10 refs.]

The author examined, by Willis's technique, the stools of 1,865 school children between 7 and 12 years of age in Teresina. He found ova of helminths in all but 229, i.e., 88 per cent. positive. Of the total there were 1,115 or 68 per cent. with one parasite only and 1,027 of these harboured *Necator americanus*; 448 or 27.4 per cent. had two, the commonest (421 cases) being *Necator* and *Ascaris*; 75 or 4.5 per cent. had three (*Necator*, *Enterobius* and *Trichuris*, 43; *Necator*, *Ascaris* and *Trichuris*, 28); 2 had all four of those mentioned. Among all those with parasites 94.3 per cent. harboured *Necator*, 32.1 per cent. *Ascaris*, 5.9 *Trichuris*, 3.6 *Enterobius*, and just under 1 per cent. *Strongyloides*. Among the children in 5 suburban schools the average infestation was 93.4 per cent., among those at 4 central schools 79.6 per cent. H. H. S.

NOLASCO (J. O.) & GACOPA (C.). **Helminthiasis in Pupils of the Balala Elementary School.**—*Monthly Bull. Bureau of Health*. Manila. 1936. July. Vol. 16. No. 7. pp. 277–280.

Faecal examination of 208 children of this school had the results given here.

Examination was by smear and, if this were negative, by floatation in brine and glycerine. The positive percentages were *Ascaris* 62.5, *Trichuris* 57.7, hookworm 4.8, threadworm 0.9. [Seeing the real or virtual visual disappearance of hookworm eggs in glycerine it will be well to take the percentage figure of that infection with special hesitation.]
Clayton Lane.

CHU (Tso-Chih), LIU (B. C.), LING (C. Y.) & ZEE (G. F.). A Survey of Intestinal Parasites in the Rural Experimental Health Area at Kao-Chiao, Shanghai.—*Chinese Med. J.* 1936. Sept. Vol. 50. No. 9. pp. 1243–1254. [13 refs.]

TALAMONTI (Luigi). Ricerche sul parassitismo intestinale dei bambini della Provincia di Modena. [**Intestinal Parasitism in Children in Modena.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Nov. Vol. 17. No. 11. pp. 690–697.

Judging from the small number examined, 150, infestation of children in Modena by parasites is very high. Only children up to 12 years of age were examined, by direct smear of the faeces or Fülleborn's or Telemann's methods. One hundred and fifteen, or 76 per cent., were found positive. *Trichuris* was commonest in 90 (60 per cent.), *Ascaris* next, 59 (39 per cent.); in 52 two parasites were present, one in 32 only. *Giardia lamblia* was found in 8, *E. histolytica* in 3; *Taenia* was not found, nor hookworm. Among those below 2 years of age 28 per cent. were positive; from 3–6 years 83 per cent., and from 6–12 years 87 per cent. [but the total in each group is not stated], none was found in sucklings. H. H. S.

MARIANI (G.) & LOPRESTI (A.). I parassiti intestinali della popolazione bianca in Somalia (dati statistici e considerazioni patogenetiche). [**Intestinal Parasitism among the White Population in Somalia.**]—*Ann. d'Igiene*. 1936. Nov. Vol. 45. No. 11. pp. 481–496. With 1 chart. [29 refs.]

During the twelve months July 1935–June 1936 the author examined [method not stated] the faeces of (A) over 1,600 persons with intestinal symptoms and (B) another 100 healthy subjects to determine the presence of protozoal parasites. He found 10 with *E. histolytica*, 8 among the first group and 2 in the second; 3 with *E. minima* (1 in A, 2 in B); 7 with *E. dispar* (2 in A, 5 in B); 66 with *E. coli* (23 in A, 43 in B); 38 with *Endolimax nana* (12 in A, 26 in B); 29 with *Giardia lamblia* (14 in A, 15 in B); *Trichomonas intestinalis* 75 (36 in A, 39 in B). It will be seen that in every case the proportion was higher, usually very much higher, among those presenting no symptoms of intestinal disturbance. H. H. S.

CABALLERO (Eduardo). Parasitos intestinales en los niños de Actopan, Hgo. [**Intestinal Parasitism among School Children of Actopan, Hidalgo (Mexico).**—*An. Inst. Biol. Mexico*. 1936. Vol. 7. Nos. 2 & 3. pp. 373-384. With 8 figs. English summary (10 lines).

The total number examined, 111, is small for general deduction, but the results show that the incidence of parasitism is high. The method of examining the stools is not mentioned, presumably it was that of direct smear. Twenty-three only were free. Of helminthic infestations the commonest was *Ascaris lumbricoides* (23 per cent.), *Trichuris trichiura* and *Hymenolepis nana* next (each 15 per cent.), then *Taenia saginata* (4), *Enterobius vermicularis* (2), *T. solium* and *Fasciola hepatica* (each 1 per cent.).

Of protozoal findings 63 per cent. were *E. coli*, 4 per cent. *G. lamblia*; *E. histolytica* and *Iodamoeba* each 1 per cent. Flagellates, not defined, were found in 35 per cent. The author states that hitherto *F. hepatica* had been looked upon in Mexico as a parasite of domestic animals only, not of man.

H. H. S.

BLANCARDI (C. F. E. A.). A propos d'un nouveau foyer de bilharziose vésicale marocaine. [**A Fresh Focus of Urinary Schistosomiasis in Morocco.**—*Rev. Service Santé Milit.* 1936. Oct. Vol. 105. No. 4. pp. 547-559.

The new focus is Assa, the most advanced post in South Morocco.

C. L.

MILLS (E. A.), MACHATTIE (C.) & CHADWICK (C. R.). *Schistosoma haematobium* and its Life Cycle in Iraq.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 317-334. With 2 plates. [18 refs.]

The snail host in Iraq is *Bulinus truncatus* whose habitat is ditches and stagnant pools, and there is heavy infection in man and snail in the Baghdad area, the time of great risk to man being June to October and of little risk December to May. The cycle of development has been traced from the egg of *S. haematobium* in the urine through *B. truncatus* to white mice, but guinea-pigs seemed immune. Many species of snails, identified by Major CONNOLLY and including 11,300 *Lymnaea tenera euphratica* were examined and are listed, but no infection was seen in any of them.

C. L.

GREPPI (Enrico). Le splenomegalie egiziane da bilarziosi nei loro caratteri ematologici e nel loro significato fra le sindromi bantiane. [**Egyptian Splenomegaly and Banti's Syndrome.**—Reprinted from *Minerva Med.* 1934. Nov. 10. 25th Year. Vol. 2. No. 45. 8 pp.

Splenic anaemia, or Banti's syndrome, as seen in Italy and Sicily has similarities to Mansonian and probably Japonic schistosomiasis.

BANTI described the splenic enlargement of splenic anaemia as a "fibroadenia" pure and simple. Its most important haematological characters are: an increase in the total plasma (held not to be a temporary hydraemia but a hyperplasia), decrease in red cells due in

part only to the increase in plasma, this increase in plasma persists after taking out the spleen, there is no sign of haemolysis. Moreover, on injection of adrenalin the spleen contracts, but not to normal, so that its enlargement is partly caused by the spleen having in it a greater amount of blood than normal and partly by an increase of what is said in one place to be an increase in stroma and in another one of fibrous tissue.

Greppi reports that E. BUCCIANTE of the Italian Hospital, Alexandria, has obtained the same results after adrenalin injection in Mansonian schistosomiasis, his 3 patients including one in whom the spleen had been removed. BANTI's conception of the splenic state being one of "fibroadenia" pure and simple is not then correct, and even should there be no contraction (Greppi has seen no such case in 8 years' investigation) this might be due to complete obstruction of the splenic circulation without collaterals, possibly to a momentary insensibility of the patient, or to fibrosis. Greppi believes that the splenic conditions caused by *S. japonicum* will prove to be of the same kind. As to Italian cases there are three possibilities of practical importance: (1) they are cases of schistosomiasis imported from Africa, (2) they are autochthonous cases in the area from Rodi to Sicily, (3) some other infective agent causes the same syndrome. Splenic enlargement from *Pentastomum denticulatum*, which has been seen in Italy, must be kept distinct. C. L.

ABDEL SHAFY MOHAMED. **A Fatal Case of Massive Bilharzia Mansoni Infection. (Acute, Fatal Egyptian Splenomegaly).**—*Jl. Egyptian Med. Assoc.* 1936. Dec. Vol. 19. No. 12. pp. 749-762. With 4 figs.

An acute case of infection with *S. mansoni* in a girl of 12 who had been infected for 7 to 8 months.

There was widespread distribution of worms and eggs in liver, omentum, mesentery, abdominal lymph nodes, jejunum, ileum and large intestine, pancreas. The lungs were noteworthy, being studded with miliary nodules from the size of a pin's head downwards composed of one or more ova with fibrocellular tissue rich in eosinophil cells and an occasional giant cell capping an ovum. C. L.

SUAREZ (Ramon M.) & BENITEZ GAUTIER (Clemencia). **The Sternal Marrow in Schistosomiasis Mansoni Chronic.**—*Bol. Asoc. Med. de Puerto Rico.* 1936. Dec. Vol. 28. No. 12. pp. 301-304.

A report from Porto Rico of 10 cases of advanced intestinal schistosomiasis in which during life sternal marrow was aspirated and venous blood removed at the same time.

"All the cases exhibited marked splenomegaly, evident signs and symptoms of liver cirrhosis and clinically and haematologically they were undistinguishable from the so-called splenic anaemia or Banti's syndrome." The percentages of nucleated cells in the marrow (minimum, average and maximum) are these: megaloblasts 0, 0.64, 1.2; early erythroblasts 0, 1.36, 2.6; late erythroblasts 0.6, 3.76, 11; normoblasts 11.6, 22.76, 38; myeloblasts 0, 0.78, 1.4; promyelocytes 2.2, 4.36, 11.4; neutral myelocytes 18.2, 25.28, 36; eosinophil myelocytes 2.4, 7.38, 15.2; basophil myelocytes 0, 0.2, 0.6; neutrophil polynuclears 10.6, 29.68, 45.2; eosinophil polynuclears 0, 0.84, 2.4;

monocytes 0, 0.02, 0.2; lymphocytes 1.6, 2.94, 5.6. As compared with normal marrow there are more normoblasts and immature granulocytes and fewer mature granulocytes. When these nucleated elements are grouped as erythroblastic, myeloblastic and lymphoblastic, there is a fall from 10 to 2.94 in the percentage of the last in schistosomiasis and slight rises in the others. C. L.

ROBERTSON (R. C.). **Schistosomiasis in the Foochow Area.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1555–1560. With 8 figs. on 4 plates.

In effect Robertson gives a summary of the work on splenomegaly done in and near Foochow City.

Patients with enlarged spleen have for some time been coming into Foochow City and diagnosed as splenic anaemia or Banti's disease. They were undernourished with fever and chills but malaria could generally be set aside; some had a history of bloody diarrhoea. Loss of weight and energy went steadily on. Schistosomiasis was believed to be absent from the area. The complement fixation test was suggestive of schistosomiasis. The first spleen examinations showed no ova, "fibrosis of the reticulum as noted in Banti's disease was observed, some normoblasts were seen in the sinuses. Fibrosis of the capsule was rather marked as from some old irritation locally, either parasitic or bacterial?" It was felt that the spleen was infected secondarily, and when the liver from a patient who died after splenectomy was sectioned schistosome ova were found in it. They were then seen in the spleen of an acute case with much ascites. Inquiry was next made in the village, where a *Blanfordia* snail was present, naturally infected with cercariae indistinguishable from those of *S. japonicum*. Faecal examination showed many of the inhabitants to be infected. C. L.

CAMPBELL (Horace Emerson). **Splenomegaly in the Foochow Area with Special Reference to Schistosomiasis, and its Relationship to Cryptogenetic Splenomegaly (Banti's Disease). A Preliminary Report.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1561–1576. [14 refs.]

In Campbell's view most of the so-called Banti's disease of the Far East is schistosomiasis.

In the Foochow Christian Union Hospital, Foochow, Fukien, ova of *Schistosoma japonicum* had never been found in the stools, of knowledge of this infection in that area there was none, and the conclusion was come to that some other clinical entity was the cause of the large spleens, often with positive "formalin" and "water" tests, which were seen there. But R. C. ROBERTSON wrote that before accepting a diagnosis of Banti's disease schistosomiasis must be ruled out, for in his findings almost every case of "Banti's disease" in Hankow area proved to be schistosomiasis. So splenectomy was begun and the consistent pathological reports on them from two laboratories were "Banti's disease." Then Professor H. H. LOUCKS of Peking, on visiting the hospital told of a simple and safe method of liver biopsy during splenectomy; and since then ova of *Schistosoma japonicum* have been got from 3 of 6 livers by autopsy or biopsy. No schistosome eggs were seen in the faeces of any of the persons on

whom splenectomy was done, but, because floatation methods had been used, this is not proof of their absence. Since there has been in use the method of hatching out miracidia [see ANDREWS, this *Bulletin*, 1935, Vol. 32, p. 627] "we are more successful." Campbell's belief is that schistosomiasis that has reached the stage in which it is confused with splenic anaemia will be treated with success only by splenectomy and specific drug therapy; and he urges on pathologists, making autopsies on such cases, a detailed search for the worms themselves when no eggs have been seen.

As to the surgical viewpoint: of the 13 patients the spleen in one was so fixed that it had to be left, of the other 12 two died of haemorrhage from liver or diaphragm and one from mesenteric thrombosis and in two of the three there was marked ascites. In the other nine there was improvement, sometimes striking. If during operation the blood platelet count rises after delivery of the spleen the advice given is that the splenic artery should be tied and the spleen put back.

C. L.

KAU (L. S.). **Histological Studies of Splenomegaly with Special Reference to Material from the Foochow Area.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1577-1584. With 8 figs. on 4 plates.

"Histological studies made in a series of 13 splenomegalies from patients in the Foochow area . . . In certain parts of the tropics splenomegaly may be caused by schistosomiasis infections . . . This condition has not been sufficiently studied in the past."

Detailed histological reports were made on 6 of these 13 cases, and on one other, the first in which ova were found in the faeces during life. Distorted schistosome ova were seen in all but one of the bits of liver got at biopsy, in the fibrous stroma under the capsule, in the walls of the bile canals and among the liver cells; when newly posited there were "round cells" about them; there was cirrhosis of the liver with atrophy of its cells, sometimes of a whole lobule. In the spleen schistosome ova were the exception, but in all there was fibrosis of the capsule and stroma with foci of haemorrhage, macrophages and multinuclear giant cells and what seemed to be calcium granules. Deposits of haemosiderin in some of them may have been caused by malaria or by the schistosome.

C. L.

YAO (Y. T.). **Report on the Investigation of Schistosomiasis Japonica in I-Hsing, Tai Hu Endemic Area.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1667-1669. With 4 figs. on 1 plate.

A report from the Department of Parasitology, Central Field Health Station, Nanking, shows that Japonic schistosomiasis is present at I-Hsing as shown by clinical symptoms and the finding of ova, while *Blanfordia* snails have in them cercariae of the schistosome type.

C. L.

TANG (C. C.). **Schistosomiasis Japonica in Fukien with Special Reference to the Intermediate Host.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1585-1590. With 4 figs. (2 on 1 plate).

The distribution of schistosomiasis in villages around Futsing City is the same as that of *Katayama tangi*, a new species.

The country here is hilly and the water of irrigation, after passage over fields whose fertilizer has been human sewage, runs back again into the stream and once more is taken off for the irrigation of fields lower down the valley. Tests were made on men of 29 villages and eggs were present in men from 16 of these, the percentage of infection is put as 1·28. The snail was named by BARTSCH *Katayama tangi*† and cercariae from it gave infection to white mice and rabbits, and adult flukes identified as *S. japonicum* were later seen in them, there being 734 in a rabbit. [It will be seen that BARTSCH is not among those who no longer use the generic name *Katayama*, see this *Bulletin*, 1936, Vol. 33, p. 7 (note 7).]

"The snail in question is a small operculate gastropod. Its dextrally coiled shell consists of 7 whorls. The shell measures 7·5 mm. in its maximum height and 3·5 mm. in its maximum width. The surface of the shell is smooth with faint sculptures. The mouth is ovate, being pointed above and broadly rounded below. On the external surface of its outer lip a coarse ridge, the varix is very prominent. The color of the shell is reddish brown. The radula pattern is typical of the Katayamid snails. It has the formula 2.1.1.1.2. The denticulation of its central tooth can be formulated as follows : 1.1.1.

$$\frac{3}{3} + 3$$

"The lateral tooth has 6 denticulations of which the third from inside is much larger and longer than the rest. The inner marginal has 9 denticulations and the outer marginal has 5. The operculum has 3·2 whorls."

C. L.

MÜHLENS (P.). 14 "Yangtse-Fieber"-Erkrankungen (Schistosomiasis japonica) an Bord eines deutschen Handelsschiffes.—[Cases of *S. japonicum* Infestation among the Crew of a German Trading Vessel.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 308-317. [12 refs.]

Fourteen sailors became infected with *S. japonicum* after bathing in the Yangtse at Hankow. They were variously treated with Sdt 386 (an organic arsenic-antimony compound), fouadin, emetine, tartar emetic, neostibosan. Visible eggs or miracidia came and went and it was not possible to say that any man was cured.

C. L.

BRUMPT (E.). Action des hôtes définitifs sur l'évolution et sur la sélection des sexes de certains helminthes hébergés par eux. Expériences sur des schistosomes. [Development of *S. bovis* in Various Hosts.]—*Ann. Parasit. Humaine et Comparée.* 1936. Nov. 1. Vol. 14. No. 6. pp. 541-551. With 2 figs. [12 refs.]

A study of the effect of different definitive hosts on the development of *Schistosoma bovis*.

The cercariae used were always got from a number of snails. The host animal had an effect on the rate of growth, on the size of the parasites and on the development of one sex or the other. The size was smallest in *Macacus rhesus* and greatest in the sheep, and as to sex, there grew in the guineapig 8,705 males and 3,739 females, in *Macacus sinicus* there were, after 139 days, 43 incompletely developed females

† *Proc. Biol. Soc. Washington.* 1936. Aug. 22. Vol. 49. p. 139.

and no males, in *M. rhesus* 89 males and 40 females all very small and all females without eggs, in the rat the worms were rather larger than in *M. rhesus* but the females were sterile. C. L.

BRUMPT (E.). *Schistosoma bovis* et *Schistosoma mansoni* ne sont pas transmis par *Planorbis* (*Indoplanorbis*) *exustus*. Observations biologiques concernant ce planorbe (autofécondation, érosion de la coquille, élevage, etc.). [Observations on *Planorbis exustus*. Its failure to act as Host of *S. bovis* or *S. mansoni*.]—*Ann. Parasit. Humaine et Comparée*. 1936. Sept. 1. Vol. 14. No. 5. pp. 464–471. With 2 figs. on 1 plate. [20 refs.]

As the title shows *Planorbis exustus* is not a host of *S. mansoni* or *S. bovis*.

While of 32 *Bulinus contortus* all became infected with *S. bovis*, none of 50 young *P. exustus* became so, and while 8 of 46 *Planorbis boissyi* became infected with *S. mansoni*, none of 50 *P. exustus* did so. Self-fertilization took place in *P. boissyi* isolated from the time of hatching, fertile eggs being laid on the 64th day when they had been kept at a mean temperature of 24°C. ; but this does not affect cross-fertilization later. The lines and hollows on the shells of wild *P. exustus* are caused by their gnawing one another's shells. Development in the laboratory is easy, and lettuce, soaked in water for a day or two, is a favourite food. C. L.

CORT (W. W.). Studies on Schistosome Dermatitis. IV. Further Information on Distribution in Canada and the United States.—*Amer. Jl. Hyg.* 1936. Sept. Vol. 24. No. 2. pp. 318–333. [14 refs.]

Cercarial dermatitis is much more widely spread in the United States and Canada than has been suspected. The localities include Manitoba, Saskatchewan, Minnesota, Wisconsin, Iowa and Michigan, as well as suspicious dermatitis from North Dakota, Illinois, Nebraska, Texas, Florida and Washington. *Cercaria tuckerensis* Miller, 1927 is a new agent as a cause of this dermatitis. C. L.

BARLOW (Claude H.). Is there Dermatitis in Egyptian Schistosomiasis ? —*Amer. Jl. Hyg.* 1936. Nov. Vol. 24. No. 3. pp. 587–599. With 8 figs. on 4 plates. [15 refs.]

The answer given to the question in the title is " Yes."

Of 107 fellaheen questioned as to personal experience of dermatitis when at work, 87 said they had this. It does not affect foot and ankle, which are buried in mud, but is evenly distributed over the rest of the submerged part, and in most of those seen by Barlow there were tiny papules all over the submerged part of the leg. The itching usually lasts 3 to 5 days, with limits of 1 hour to 20 days after leaving the water, but washing in well water and then soaking in hot salt water stops all itching, and if there is no scratching, itching stops the sooner. Women washing clothes at the canal side had no itching, for, as they reasonably said, they used soap.

A number of volunteers were deliberately infected with cercariae of the schistosome they already harboured, this was done under carefully controlled conditions and after promise that they would take treatment. There is a difference in the dermatitis caused by the two species.

"*S. haematobium* produced discrete spots of swelling which later became red, leaving red spots all over the area to which the cercaria-bearing water was applied. On the other hand, *S. mansoni* produced general swelling, which later became red, leaving one large, red, swollen area where the application had been made. This swelling subsided later, leaving the papules looking just like those caused by *S. haematobium*."

C. L.

LOVETT-CAMPBELL (A. C.) & ROSE (A. W.). **Bilharzial Appendicitis in *Schistosoma haematobium* Infestations. A Preliminary Report.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 335-344. With 14 figs. on 3 plates.

"Bilharziasis causes its own type of appendicitis, the symptoms of which occasionally become urgent enough to warrant surgical intervention. The gross pathology encountered bears this out."

The appendix was taken out at operation in 35 persons in a hyperendemic area in Northern Nigeria. Ova of *S. haematobium* were present in the urines of all of them and in 20 of their appendices there were eggs of this parasite. The examinations for these bodies were stringent—scrapings, sections, and digestion in 4 per cent. KOH of all the otherwise unexamined part of the appendix if eggs were not seen without this. In 4 only were the colicky symptoms held to be accounted for by the gross lesions present in the appendix. These were greyish tubercles 1 to 2 mm. across on the peritoneal surface of 3, and, microscopically, eggs, round cells, "wandering cells," giant cells, fibroblasts with onion arrangement of fibres, and eosinophil cells. Some of the smaller vessels in the serosa had cuffs of round cells. The sites of the eggs were, submucosa 5, submucosa and mucosa between the gland crypts 7, submucosa and serosa 1, all coats including muscular 4, unknown 3. Where there were very many eggs there were not always gross lesions, and 2 with gross lesions had few eggs. The pseudo-tubercles are in the authors' belief formed in this way—

"The eosinophils which are concentrated immediately around the ova commence to degenerate. Very soon mononuclear cells, wandering cells, and fibroblasts range themselves around the degenerate central mass in a radial manner like the spokes of a wheel. Multinucleated giant cells, similar to those found in tuberculous tissues, make their appearance, and a confining wall of hard fibrous tissue is laid down at the extreme periphery."

Between them the condition is this—

"... fibrous granulation tissue is present infiltrated with eosinophils, fibroblasts, plasma cells, mononuclear cells, and occasional ova. Capillaries are numerous but do not seem to enter the pseudo-tubercles. It is common to find the whole appendicular wall involved in the more advanced cases in which pseudo-tubercles at all stages are seen, but the mucosa as a rule is not invaded by fibrous reaction. It may be pressed upon and the lumen distorted."

C. L.

- MAINZER (Fritz). Ueber isolierte Lungenbilharziose, besonders im Röntgenbild, und ihre Differentialdiagnose gegenueber der Lungentuberkulose. [**Pulmonary Schistosomiasis and its Differentiation from Tuberculosis by X-rays.**—Reprinted from *Fortschritte a. d. Gebiete d. Röntgenstrahlen*. 1936. Vol. 54. No. 2. pp. 154-173. With 15 figs. [13 refs.]
- & YALOUSSIS (Evangelos). Ueber latente Lungenerkrankung bei manifester Blasenbilharziose. (Nach Röntgenuntersuchungen.) [**Latent Pulmonary Infection in Urinary Schistosomiasis.**—*Ibid.* No. 4. pp. 373-381. With 8 figs.]

In the first paper 5 and in the second 20 persons are considered as to the X-ray findings in *S. haematobium* infection and to the diagnosis from tuberculosis. It seems that, even when there were no clinical signs of affection of the lungs, there were radiographed evidences of abnormality in a quarter of the infected. C. L.

- KAN (Huai-chieh). Further Note on the Intracutaneous Test with *Schistosoma japonicum* Antigen.—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1649-1652.

- PIERI (J.) & SARDOU. A propos d'un cas de bilharziose vésicale traité par le 110 L (antimoniouthiomalate de lithium). [**Urinary Schistosomiasis treated by 110 L.**—*Marseille-Méd.* 1936. June 5. Vol. 73. No. 16. pp. 749-754.]

A case of cure in a boy of 12 who had 30 cc. of lithium antimony thiomalate in all in bi-weekly doses of 1, 2 and 3 cc. and was observed for 7 weeks. There were no ill effects. C. L.

- CAWSTON (F. Gordon). **Destruction of the Bilharzia Parasites of Man.**—*South African Med. Jl.* 1936. Sept. 12. Vol. 10. No. 17. pp. 608-610.

"Intravenous injections of antimonium potassium tartrate in non-toxic doses is the method of choice for curing bilharzia disease.

"The introduction of remedies which can be administered with less skill has resulted in many cases being treated without due regard to the condition of the escaping ova and the eosinophile counts.

"Until the investigation is carried out on an adequate number of cases it is impossible to determine what total dose of the less irritating compounds is necessary or whether certain cases may prove to be less responsive to treatment in this way.

"Persistent eosinophilia lasting for more than a few weeks suggests the possibility of pathological disorders such as carcinomatous growths occurring from an incomplete course of treatment, and the escape of even dead ova indicates that some of the parasites may not have been destroyed."

C. L.

- CAWSTON (F. G.). **Bilharzia Infection in Blind Lagoons.**—*South African Med. Jl.* 1936. Oct. 24. Vol. 10. No. 20. pp. 698-699.

"Such experiences prove the need for an authoritative statement as to the control of bilharzia infection along the Natal coast."

Here is one of the experiences: "Others have brought river water contained in bottles and have even rested content with a laboratory

report that the sample was free from bilharzia infection. One might with equal logic believe that the sea was free of sharks because none were found in a sample of sea water."

C. L.

KAN (Huai-chieh) & KUNG (Jen-chi). **A Preliminary Report on the Specific Treatment of Schistosomiasis Japonica.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1637-1648. [28 refs.]

A comparison is made of the effects of sodium antimony tartrate, fouadin, and emetine hydrochloride in the treatment of japonic schistosomiasis.

In all 352 persons were treated, but only 46 had 10 or more injections. Of 24 of them who were given fouadin (four of them also getting the tartrate) the results after treatment judged by the presence of eggs were 15 cured, 8 not cured, 1 not examined; the figures for tartrate were 18 treated, 15 cured, 3 not cured; and for emetine 4 treated, 2 cured, 2 not cured. The tartrate was the best and cheapest drug, fouadin less effective and twenty-five times as costly, while emetine was 50 times as costly and its poisoning of the heart most grave.

C. L.

YUMOTO (Y.). **On the Minute Structure of the Egg-Shells of *Clonorchis sinensis*, and on its Abnormal Eggs.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Aug. Vol. 35. No. 8 (377). [In Japanese pp. 1836-1844. With 6 figs on 1 plate. English summary pp. 1845-1846.]

Malformed eggs without miracidium or operculum or both are often seen. The pattern on the shell is believed to be due to varying thickness of the outer shell.

C. L.

UJIE (Naoki). **On the Process of Egg-Shell Formation of *Clonorchis sinensis*, a Liver Fluke.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Aug. Vol. 35. No. 8 (377). [In Japanese pp. 1862-1894. With 4 text figs. & 5 plates (1 coloured). [27 refs.] English summary pp. 1894-1896.]

The processes of formation of the egg are studied, namely the surrounding of the egg cell by yolk cells, its fertilization, the formation of the shell and operculum, the movement of these constituents along the genital system, and the possible function of Laurer's canal.

C. L.

Hsu (H. F.) & KHAW (O. K.). **Studies on Certain Problems of *Clonorchis sinensis*. I. On the Cysts and Second Intermediate Hosts of *C. sinensis* in the Peiping Area.**—*Chinese Med. Jl.* 1936. Nov. Vol. 50. No. 11. pp. 1609-1620. With 1 text fig. & 20 figs. on 9 plates. [24 refs.]

The cysts are spherical, oval or elliptical measuring 0.121-0.15 by 0.085-0.14 mm. They have two hyaline walls, the outer 3 μ thick digested by trypsin acting after pepsin, the inner "thin, membranous and collapsible" actively ruptured by the metacercaria. This last is

being separately described, but has no eyespots, the excretory bladder is oblong never Y-shaped, and is filled with coarse concretions which are black by transmitted light, the cuticle is covered with delicate spines. The percentage of the sites of cysts are : flesh 87·4, skin 5·9, gills 4·7, scales 2. Their diagnosis from those of some other trematodes is made in this way—*Metagonimus yokogawai* cyst discoidal, excretory bladder Y-shaped, acetabulum laterally displaced, spines coarse ; *Metorchis orientalis* outer wall of cyst 20 μ thick ; *M. taiwanensis* outer wall of cyst 30 μ thick ; *Echinochasmus perfoliatus* cyst 67 μ by 74 μ , excretory bladder has 2 lateral stems running forwards zig-zag. The 13 intermediate hosts are grouped in 4 classes according to susceptibility to infection. The largest number of cysts in 1 fish was 166 in *Pseudorasbora parva* or 55 to every gram of its flesh. It is commonly used raw to feed cats and dogs. C. L.

OTTO (Johann H.) & TSCHAN TSCHING JI. Massenansammlung von Eiern des Leberwurms *Opisthorchis sinensis* in der Gallenblase bei Verschluss der Papilla Vateri. [Massed Ova of *O. sinensis* in the Gall-Bladder with Occlusion of the Ampulla of Vater.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Nov. Vol. 40. No. 11. pp. 516-517.

The real interest here is surgical and the fluke infection an accident. A man with this infection had a warty carcinoma about the ampulla of Vater with the bile duct as big as a thumb, the gall-bladder enlarged with about a million *Clonorchis* eggs in it and the liver hard and big. The gall-bladder was opened into the duodenum and the man recovered from the operation without complication, to be then lost sight of. [It is a striking fact that a second case of warty growth in this place with the same symptoms has come to the reviewer's notice within a week.] C. L.

OTTO (Johann H.). Zur Frage der röntgenologischen Erkennbarkeit krankhafter Veränderungen am Magen-Darmkanal bei Patienten mit *Opisthorchis sinensis*. [X-ray Examination of Patients with *Clonorchis sinensis*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 296-302. With 3 figs.

The changes shown by X-rays in those with eggs of *Clonorchis sinensis* in the faeces are adhesions between the duodenum, gall bladder, lower surface of the liver and the hepatic flexure of the colon ; a dragging of the duodenum upwards and to the right ; and ulceration as the result of the other changes. C. L.

VOGEL (Hans). Beobachtungen ueber die Lebensgeschichte von *Opisthorchis felineus* in Ostpreussen. [On the Life-History of *O. felineus* in East Prussia.]—*Zent. f. Bakt.* I. Abt. Orig. 1937. Jan. 15. Vol. 138. No. 3/4. pp. 250-254. With 3 figs.

Vogel adds to his observations on the life history of *O. felineus* in E. Prussia.

Of 723 *Bythinia leachi* examined 6 were infected. The fish *Tinea vulgaris* when infected has pigmented rings on the fins, the cat is an important reservoir host for man and the carriage by rain water of its faeces into streams lets infection get to the snails. C. L.

FUKUDA (S.) & MORIKAWA (K.). Ueber die Metagonimiasis Yokogawai in Dairen. [**Infestation by *M. yokogawai* in Dairen, Manchuria.**—*Jl. Oriental Med.* 1936. Nov. Vol. 25. No. 5. [In Japanese pp. 1031-1042. [36 refs.] German summary p. 85.]

At Dairen, near Port Arthur, *Metagonimus yokogawai* infection has been found in 38 of 5,077 patients. C. L.

KOBA (Kazuo). **Revision of the Specific Name of a Crab as a Second Intermediate Host of *Paragonimus westermani* in Formosa.**—Reprinted from *Science Reports of the Tokyo Bunrika Daigaku*. Section B. 1936. Feb. 15. Vol. 2. No. 39. pp. 201-207. With 1 fig. [30 refs.]

The crab which was identified by A. TERA0 in 1915 as *Potamon (Geotelphusa) obtusipes* (Stimpson), 1858 is in reality *Potamon (Potamon) rathbuni* de Man, 1914. C. L.

BERCOVITZ (Z.). **Clinical Studies on Human Lung Fluke Disease (Endemic Hemoptysis) caused by *Paragonimus westermani* Infestation.**—*Amer. Jl. Trop. Med.* 1937. Jan. Vol. 17. No. 1. pp. 101-122. With 3 figs. [77 refs.]

Of 1,108 sputum examinations made at the Pyengyang Union Christian Hospital, Korea, 108 were positive for paragonimus eggs, 190 for tubercle bacilli and 14 for both. The literature, symptoms and physical signs, pathology, diagnosis and treatment are covered.

Cough, haemoptysis, the eggs in the sputum with almost no other symptoms and practically normal physical and X-ray examinations are the rule. Other symptoms are probably caused by some other condition in the lungs. Examination of the sputum for eggs may have to be made again and again. The cell collections in the lungs are mostly of lymphocytes and plasma cells, there being few eosinophils.

"Treatment has been mainly by the use of emetine in two courses consisting of 1 grain (0.06 gram) daily by hypodermic injection for 7 days, with a period of 1 week's rest, then a repetition of the treatment. Intravenous administration of emetine is absolutely contra-indicated in pulmonary distomiasis. Lipiodol oil instillations into the bronchi for diagnostic purposes seemed to give a measure of relief from the symptoms of cough, and in 1 case the patient stated that the bloody discharge was less Up to the present, it is not possible to point to a single case which has been 'cured,' although many seem to be improved. Most of these patients under times of stress and strain, fatigue, or other unfavorable conditions, again develop blood-tinged sputum in the morning, and the ova again make their appearance, even after a lapse of several years."

C. L.

SOETJANHO (M.). Een geval van Paragonimiasis.—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Oct. 20. Vol. 76. No. 42. pp. 2670-2672. English summary (2 lines).

WATT^a (J. Y. C.). **Incidence of Helminthic Parasites with Special Reference to the Epidemiology of Fasciolopsiasis Buski in Shiao-shan, Chekiang 1934-35.**—*Chinese Med. Jl.* 1937. Jan. Vol. 51. No. 1. pp. 77-84. With 1 map. [19 refs.]

A faecal survey of 1,120 out of 8,000 to 10,000 local villagers.

The examinations were of 3 thin smears in saline, except for a few in which Telemann's method was used. The positive percentage results were—*Ascaris* 38·04, hookworm 0·89, *Trichuris* 12·32, *Fasciolopsis* 83·84. *Fasciolopsis* infection varies with age and sex, the percentages being—in male children 91·6, in male adults 75·5, in female children 83·81, in female adults 69·22. The metacercariae of *Fasciolopsis buskii* were seen on *Zizania aquatica* as well as on water chestnuts and caltrops, but no adults were seen in cats, dogs or pigs. C. L.

PENSO (Giuseppe). Sull'azione della calciocianamide sopra le cercarie dei distomi. [The Action of Calcium Cyanamide on Cercariae.]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Dec. Vol. 17. No. 12. pp. 705–709.

The author tested the lethal effect of different strengths of calcium cyanamide on cercariae of *Fasciola hepatica* and of *Cercaria burti* var. *icnusae*. Solutions of the cyanamide were made in strengths of 4, 2, 1 and 0·5 per thousand and 10 cc. of each of these was added to an equal quantity of water containing the cercariae. In the case of those of *F. hepatica* the resultant 2 per thousand (i.e., the 4 per thousand original) caused cessation of movement in one minute, death of most in three and of all in five minutes; with 1 per thousand solution a few survived for 5 minutes but all were dead in fifteen. With *C. burti*, 2 per thousand killed all in 3 minutes and 1 per cent. in 5 minutes. With lower dilutions some were still alive after an hour. H. H. S.

CAVAZZI (Gino). L'azione della calciocianamide su varie specie di molluschi. [The Action of Calcium Cyanamide on Various Molluscs.]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Dec. Vol. 17. No. 12. pp. 710–713.

Tests similar to the above were tried on *Limnaea stagnalis*, *L. auricularia*, *Planorbis corneus* and *Paludina contecta* collected at S. Germiniano, 6 kilometres south-west of Modena. A strength of 1 in a thousand killed all in half an hour and of 0·5 per thousand in one hour, higher dilutions being ineffective even in 24 hours. Larger specimens of the same, obtained at Bomporto, low lying marshes, required 1 per thousand strength acting for 12 hours. The action of the cyanamide on terrestrial molluscs was impracticable because even 1 per thousand was not lethal after 24 hours and higher concentrations injured the plants. H. H. S.

TARASSOV (Victor A.). Expérience acquise par cinq années d'étude sur les Bothriocéphales dans la partie nord-est de l'U.R.S.S. (1931–1935). [Results of a Five Years' Study of *Diphyllbothrium* Infestation in North-East Russia.]—*Ann. Parasit. Humaine et Comparée.* 1936. Sept. 1. Vol. 14. No. 5. pp. 472–484. With 3 figs.

A campaign in Carelia has resulted in a great lessening of infection with *D. latum*.

The record is certainly on a grand scale: maximum degrees of infection in man of 63·3 to 78·2 per cent., 90 metres of tapeworm (6 worms) from one woman, 143 worms from another, a man of 100 infected for 40 years, infection in man, dog, cat and pig. By *intra vitam*

staining it has been shown that plerocercoids may be transferred from fish to fish and will develop, they may pass through the wall of the stomach into the peritoneal cavity. The plerocercoids called "Type B," found in *Coregonus albula* (sic.), *Thymallus thymallus*, *Osmerus eperlanus* are not those of *D. latum*, so these fish are not a danger to man. A campaign against infection has reduced this in man to 18.3 per cent.

C. L.

- i. WARD (Henry B.). **The Longevity [of] *Diphyllbothrium latum*.**—*Parasites, Transmetteurs, Animaux Venimeux Recueil des Travaux dédié au 25-me Anniversaire Scientifique du Professeur Eugène Pavlosky 1909-1934, Moscow, 1935.* pp. 288-294. [18 refs.] Resumé in Russian on p. 294.
- ii. LEIPER (R. T.). **Some Experiments and Observations on the Longevity of *Diphyllbothrium* Infections.**—*Jl. Helminthology.* 1936. Sept. Vol. 14. No. 3. pp. 127-130.

i. The life span of *D. latum* is discussed.

Ward had already in the De Lamar Lectures, Johns Hopkins University, 1930, given his view that infection with the broad tapeworm was much more widely spread in the United States than was generally thought, so that what were really reinfections were being put down to one long-lasting infection; but being impressed by persistence of belief that the worm was in fact long lived, he now reviews the literature and holds that his careful analysis of many of the cases shows very clearly that there was reinfection.

Ward quotes writers from BREMSER (1819) onwards, for the conclusion that this infection lasts 6, 10, 12, 14 and 21 years, and American writers for the belief that infection could not be got in America. But when there was proof that the infection could be got in America, doubt was thrown on the long life of the tapeworm. He goes on to a discussion of the paper by LEIPER, "A cryptic infection with *Dibothriocephalus latus*" [this *Bulletin*, 1929, Vol. 26, p. 538] with the use of these words "I have been unable to find other evidence that this parasite may at times enter upon a resting stage as it were. Such an interval of inactive growth and non-productivity of eggs seems not to have been demonstrated for this species." It is pointed out that the variability of the incidence and degree of anaemia in those harbouring this parasite has led to confusion. "Unfortunately I have found no records and have been able to obtain no experimental evidence indicating definitely the age attained by individuals of the species *Diphyllbothrium latum*. To be sure in dogs it seems to persist only for brief periods although the evidence on this point is not conclusive."

ii. Leiper gives his reasons for the belief that *D. latum* did in his case live in man for 5 years.

He was in 1922 priest and victim (see Case A, LE BAS, this *Bulletin*, 1925, Vol. 22, p. 475 and 1929, Vol. 26, p. 538). He adds to earlier information with a record of his journeys and his reasons for the belief that further infection was not got on them. After treatment with carbon tetrachloride he was the only one of the three victims who did not pass as many tapeworm heads as swallowed plerocercoids; he was one short.

"During my stay in Cairo I contracted an acute attack of dysentery and on the 8th February, 1928, as a result of a personal examination

of my faeces for *Entamoeba histolytica*, I discovered vast numbers of eggs of *Diphyllbothrium latum*. For purposes of study I retained the infection for 10 months. Not only had there been a complete absence of passage of tapeworm segments from the initial infection on 27th September, 1922, and during my illness in February, 1928, but this complete absence continued, although eggs were constantly present in the stool, until the adult tapeworm was finally removed by treatment in December, 1928. The conclusion at which I arrived was that, although the parasites had developed normally, in my case the mature segments were continually digested, whereas in the cases of my two colleagues, long portions of strobila were passed intermittently. Lest it be suggested that strobila were passed but overlooked, I may add that I have always followed the advice given by Manson to his students to observe daily the character of one's own stools as an index of intestinal health."

There was not and there was not claimed a 4-year period of "total inactivity," merely a continued absence of the passage of segments. Further during the period of 10 months between the discovery of eggs and the removal of the worm by treatment no segments were ever passed.

Leiper then gives details of a dog, a normal host for *D. mansoni*, in which this tapeworm lived for 8 years under stringent experimental conditions for the prevention of reinfection. While then the fact that infection with *D. latum* may be got in America makes long infections in Finnish, Polish and Russian immigrants a matter of some doubt, "the experimental cases cited above seem sufficient to controvert the conclusions reached by Ward from his consideration of the literature bearing upon the longevity of *Diphyllbothrium latum*."

C. L.

HERNBERG (Carl August). **Concerning the Anti-Anaemic Influence of the Gastric Juice in Pernicious Botriocephalus Anaemia.**—*Acta Med. Scandinavica*. 1936. Supp. 78. pp. 582–587. With 1 fig.

In 3 cases the effect of Castle's haemopoietic factor on this anaemia was tested.

In one who had had diphyllbothrium anaemia 22 years before and had been cured of the anaemia and freed of the worm, the gastric juice contained active quantities of the anti-anaemic factor. Another who was still harbouring the worm had a gastric juice in which this factor was reduced. On the third subject the result of the test was difficult to interpret owing to the small amount of gastric juice secreted.

C. L.

FERMOSELLE BACARDI (J.) & PORTUONDO DEL PINO (A.). *Hymenolepis diminuta*. Caso humano. [A Human Case of Infestation by *Hymenolepis diminuta*.]—*Rev. Parasit. Clin. y Lab. Habana*. 1936. July–Aug. Vol. 2. No. 4. pp. 629–633. With 1 fig.

The eggs were found in a specimen of faeces of a child of 7. After an anthelmintic no strobile was passed. No eggs were found later.

C. L.

MAGATH (Thomas B.). **Hydatid (Echinococcus) Disease in Canada and the United States.**—*Amer. Jl. Hyg.* 1937. Jan. Vol. 25. No. 1. pp. 107-134. With 2 figs. [73 refs.]

Only once in about 5 years does any one at all get infected with hydatid in the United States or Canada, any one that is who has been born and lived all his life there.

This paper takes note of all cases which it has been possible to collect from these countries since 1808. They number 482. Where the nationality is known, 95 per cent. of all infections have been in immigrants, and 4 others probably got their infection when travelling abroad, leaving 3 persons who probably did so in Canada and 19 in the United States. Most of the infections have been in males, particularly young adults, there have been 12 only in children. The countries of origin and the cities in which diagnosis was made are given. There seems to have been no increase in the rate of infection in man since 1924, in pigs it seems there has. The normal cycle of life history is wolf to moose, or something like it, with pig and man as unusual hosts of the larva.

C. L.

PENFOLD (W. J.), PENFOLD (H. Boyd) & PHILLIPS (Mary). **Ridding Pasture of *Taenia saginata* Ova by Grazing Cattle or Sheep.**—*Jl. Helminthology.* 1936. Sept. Vol. 14. No. 3. pp. 135-140.

A pasture contaminated with onchospheres of *Taenia saginata* became clean in course of time.

The onchospheres lying on grass get eaten by sheep or cattle, they infect cattle but not sheep; after 5 months the number of cysticerci in sites of election fell in 3 groups of clean calves from 349 in the first to 2 in the last. There are 3 possible factors in this. Groups 1 and 2 had eaten an enormous number of onchospheres as the experimental pasture had been irrigated with raw sewage to which 10 million *T. saginata* eggs had been added. Ageing lessens infectivity, for eggs kept in saline at 2°-5°C. are not viable after 16½ weeks. Meteorological conditions may have been responsible, but that is felt to be of little importance here.

C. L.

LIU (Hsiao-Liang). **Betel Nut as a Useful *Taenia* fuge.**—*Chinese Med. Jl.* 1936. Sept. Vol. 50. No. 9. pp. 1273-1278.

Ten cases were treated with betel (areca) nut and 15 tapeworms came away, 2 *T. solium*, 10 *T. saginata*, 3 unnamed.

The dose is 30 gm. of powdered or thinly sliced betel nut boiled for 30 to 60 minutes in 200 cc. of soft water, to be taken on an empty stomach in the early morning. Usually the bowels are open within 3 hours, if not a saline or castor oil is given. No food to be taken for six hours after the betel nut. In the 8 cases of which there are details segments or heads were passed. In one there were two heads of *T. saginata* and 1 of *T. solium*.

C. L.

FITTE (Oscar A.). Un caso autóctono de *Taenia solium* observado en Jujuy.—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Mar. Vol 7. No. 3. pp. 382-385. With 2 figs.

PLAGUE.

UNION OF SOUTH AFRICA. ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH FOR YEAR ENDED 30TH JUNE, 1936 [THORNTON (E. N.), Secretary]. [Plague pp. 37-43.]

Epizootic plague continues to be a menace in the Union of South Africa and this applies particularly to plague among wild rodents as distinct from the domestic rodent, the rat. The fleas of these animals are not so prevalent on the rodents captured above ground as below ground. It is the nests of gerbils and water rats which "have in several instances been found to be teeming with them."

Transport of rodents by road and rail is receiving the special attention of the Department of Health. It should be the duty of farmers and storekeepers to keep their cars and lorries free from rodents. How important the road transport may come to be is exemplified by the fact that in one particular outbreak "several relatives and friends summoned by telegraph to attend . . . funerals had made the return journey . . . a total distance of 300 miles within 24 hours."

In some countries sylvatic plague, the plague of the wild rodent, does not have the importance for human beings which plague among domestic rats has. This may be the case, for instance, in the territories of Kenya, Uganda and Tanganyika. But "in the Union of South Africa and countries immediately to the north and west of it, the incidence of human plague is determined by the epizootic among wild rodents, infection being in great part direct from wild rodents and to a less extent from domestic rats infected by fleas from wild rodents." It is evident therefore that systematic watch for the signs of spread or intensification of plague among wild rodents is an essential part of a plague campaign and that "concerted action along frontiers is very desirable."

The human cases and deaths for the year were 253 and 165 respectively as compared with 290 cases with 184 deaths in the previous year.

W. F. Harvey.

BOMBAY: REPORT OF THE HAFKINE INSTITUTE FOR THE YEARS 1932-35 [SOKHEY (S. S.), Director]. **Part II. Research Work.**
A. Plague. pp. 51-89.

This report, in its section relating to plague work, collects together important findings and experiments which have been spread over the past few years. The most important of these have reference to the measurement of virulence of the plague organisms and the estimation of immunizing values of vaccine and serum.

Previous workers have not used exact methods of test and thus there has been conflict over the use of dead or living vaccines, vaccines grown at 27°C. or at 37°C., utility of sediment or supernatant fluid of a vaccine and the use of broth or agar plague cultures.

Measurements of the quantity of plague organisms used in tests of virulence of vaccine have been done by a colony method, where the medium was a blood agar and the optimum temperature of growth was 25°C. Again, the test animal is of the highest importance, as it should be consistently and uniformly susceptible to plague. Inbred laboratory white mice over three months of age and weighing between 23 and 28 gm. are employed for this purpose. The test

of virulence is given as: "A 2 mm. loopful of the culture, of which it is desired to test the virulence, is inoculated into 10 cc. of nutrient broth and incubated for 48 hours at 25°C. 0.55 cc. of this subculture is then inoculated into 9.5 cc. of broth and incubated for 48 hours at 25°C. Suitable dilutions in saline are made from this second subculture and required dilutions are inoculated into mice A batch of five mice is used." When it is a matter of an infective test dose for the evaluation of the potency of a vaccine, the same procedure is followed. In this case a 1-100,000 dilution of the second broth subculture constitutes the standard test infective dose of 0.5 cc., which has been found to contain 60 to 120 organisms. It is given 7 days after the second portion of the immunizing test vaccine.

The maintenance of the virulence of plague cultures is a point of great importance for a laboratory engaged in the manufacture of vaccine on a large scale. Preservation of cultures at 37°C. and at 25°C. resulted in steady loss of virulence and the temperature which was found effective in this respect was one of 4°C. \pm 2°C. Virulent strains are obtained as primary cultures from severe septicaemic human cases by plating venous blood on agar slopes.

The results of vaccine trials are expressed in terms of the minimum mouse protective dose, which is "the amount of a given vaccine that will protect more than half the mice immunised with a vaccine against the standard test infective dose," or 3 animals out of 5. With these methods SOKHEY has been able to show that vaccines made from cultures at 27°C. are appreciably superior in protective power to those incubated at 37°C., that heat-killed vaccine is "150 times as potent as the live avirulent vaccine made from the same strain," that even guineapigs are as easily protected against plague as are mice with heat-killed vaccines and that the supernatant fluid in HAFKINE's vaccines is protective, while the sediment is not. He has also been able to demonstrate capsules to the plague bacilli cultivated at both 27°C. and 37°C., that virulent plague cultures can be rendered avirulent by subculturing them at 37.5°C. for about 60 to 70 weeks and that the failure of previous workers to immunize with heat-killed cultures has been due to the temperature or duration of time used for killing: he used a temperature of 55°C. for 15 minutes only.

Work on antiplague sera has perhaps not reached the same stage as that on vaccine but the results are now quantitatively measurable and tests in the field of a 2-fold or 1½-fold concentration seem promising.

Some work on a potent plague bacteriophage seemed to show that it had "little or no action in the body."

Under the heading of "rat and flea destruction" tests are described for determining the minimal quantity of a given preparation "required to kill all the rats and fleas exposed to the product in an artificial burrow of a given size." In those tests it was shown that a preparation called "calcid" with only twice the amount of hydrocyanic acid contained in "cyanogas A" was nevertheless 42 times as effective.

All these experiments are manifestly practical and of great importance for the campaign against plague infection. W. F. H.

CAMPBELL (A. E.). *Plague in Secunderabad, 1934-1935.*—*Jl. Roy. Army Med. Corps.* 1936. Dec. Vol. 67. No. 6. pp. 372-380.

This account of an epidemic of plague lasting from August 1934 to March 1935, in the civilian population of a military area is a graphic

tale of difficulties arising through prejudice and lack of public co-operation. The epidemic came to an end in due course and preventive measures against a recurrence have been elaborated and are given in some detail under the headings : rat campaign, by-laws, case investigation, inoculation and disinfection, and health camps. W. F. H.

MEYER (Karl F.). **The Sylvatic Plague Committee.**—*Amer. Jl. Public Health.* 1936. Oct. Vol. 26. No. 10. pp. 961-969.

Sylvatic plague, a term first proposed by JORGE under the name "selvatic plague," is the type of infection which occurs among wild rodents as distinct from the domestic rodents or rats. The course of epizootics of sylvatic plague is essentially independent of man's lines of communication, and is as a rule located in deserts or steppe-like countries. It spreads slowly from colony to colony of wild rodents, of which 72 species are definitely "known to suffer from spontaneous plague," and presents therefore considerable differences from a rat epizootic. Thus sylvatic plague tends to remain localized, since it is maintained in each region by a particular fauna. One principal species, "belonging as a rule to the family of sciuridae and gerbillinae living in subterranean colonies" is the pestiferous agent. Epidemicity is brought about by the contact of rodents ("varieties of muridae perhaps jaculidae") on the one hand with the wild rodent and on the other hand with man or the domestic rodent. Each group of wild rodents has its own types of the pulicidae. "The mechanism of transmission as established by BACOT and MARTIN has been confirmed by GOLOV and JOFF for the *Ceratophyllus tesquorum* of the suslik (spermophile or ground squirrel of North-eastern Europe and North-western Asia)." Some of the fleas, it seems proved, have carried infection for 206 days and starved for nearly 196 days. Flea indices are not easy to obtain, for to get them it would be necessary to count not only the fleas captured on the animals but also those in the burrows. Other features of sylvatic plague are the occurrence of lesions in the lymph nodes without obvious symptoms of infection or even gross pathology. Primary pulmonary localization also is commoner than in rats. Location of plague among wild rodents may be difficult and a new technique has been evolved for the purpose. It is of the nature of mass inoculation and is illustrated, for example, by the collection of the fleas present on the rodents and the injection of a suspension of the insects into guineapigs. This method has proved useful in demonstrating latent or subacute plague in squirrels of various districts in California. A special committee for sylvatic plague has been formed representative of a number of States in America and this article by the Chairman of the committee is part of an attempt to make the "present day knowledge concerning plague of the wild rodents more widely available." W. F. H.

ROBERTS (J. Isgaer). **Plague Conditions in an Urban Area of Kenya (Nairobi Township).**—*Jl. Hygiene.* 1936. Oct. Vol. 36. No. 4. pp. 467-484. With 2 graphs.

Nairobi township, 5,452 to 5,700 feet above sea level, lies at the commencement of the Kenya highlands. Although rail and motor traffic bring cereals direct from plague-infected centres, the township "only records outbreaks at regular intervals and enjoys quite lengthy

quiescent periods." There is a general tendency to connect outbreaks with climatic conditions. It would seem that this connexion is one with heavy rainfall, which gives a cereal abundance, but which is apt to delay drying of the crop and to disorganize traffic. If at the same time low prices prevail, export quotas will be small and quantities of grain in storage increase. Add to these factors improvidence, negligence and general prodigality and an explanation is forthcoming of the rise in the rat population in highly productive years. Plague outbreaks "are associated with grain storage years."

In Nairobi *Rattus rattus* is the domestic rat. The flea species distribution on rats seems definitely to depend on the type of building and it has been found that *Xenopsylla cheopis* fleas choose *Rattus*, which nests in underground floor burrows, as their host, whereas *Xenopsylla brasiliensis* fleas choose *Rattus* living or nesting in the walls and roof, whether of wood, iron or thatch. These facts when applied to rural areas again explain why the *Rattus* of thatched roofs is infested almost entirely by *brasiliensis* and why "field rodents such as *Mastomys coucha* and *Arvicanthis abyssinicus* living underground are hosts to *Xenopsylla cheopis*."

W. F. H.

ROBERTS (J. Isgaer). **Plague Conditions in a Rural Endemic Area of Kenya (Keruguya District, Kikuyu Province).**—*Jl. Hygiene*. 1936. Oct. Vol. 36. No. 4. pp. 485–503. With 1 fig.

Keruguya district, 4,200 to 5,200 feet above sea level, is a highly endemic plague area where not a month, during the last 10 years, has gone by without report of plague in man or rats. Food is abundant but diets are monotonous and ill-balanced, being mainly cereal with a shortage of milk and meat. Although the inhabitants are mostly prosperous, the village huts are primitive with low walls and an untrimmed thatch reaching almost to the ground.

In a rat survey of domestic premises it was found that 75 per cent. of the *Rattus* population was female and, in accordance with the general finding for rats nesting in thatch, the infesting flea was *Xenopsylla brasiliensis*. This flea seems to be equally efficient as a plague vector with *cheopis*. The rats of this highly endemic area were found to be just as susceptible to plague as the rats of non-endemic areas. Field rats come close up to native habitations and may be found even within huts or in gardens. Such field rats are *Lophuromys aquilus*, *Mastomys coucha* and *Lemniscomys massaicus*. "As there is undoubtedly an interchange of fleas between the various species of rats, it was expected that field rodents would also be found infected and that even epizootics would occur among them So far, not a single field rat has been found naturally infected with plague."

Plague in Keruguya is only of a smouldering though endemic type and does not become epidemic. Thus the generalization seems justified that "in Africa human habitations with *Rattus* in the roofs suffer from plague in an endemic form and habitations with *Rattus* underground suffer from epidemic plague." The difference here recognized does not seem to depend so much on the flea of the two types—*brasiliensis* and *cheopis* respectively—but on the greater opportunity the underground rat has of contact with man.

Another interesting point brought out is that there is "no evidence to show that there is carriage of infection from endemic centres either by rats, fleas, merchandise or man."

W. F. H.

ROBERTS (J. Isgaer). *The Carriage of Plague.*—*Jl. Hygiene.* 1936. Oct. Vol. 36. No. 4. pp. 504-506.

A contribution is made in this article to the much debated question of the carriage of plague by man and in grain. It is summarized by the author as follows :—

" (1) Nairobi township and other areas about the Mount Kenya endemic centre have frequently been penetrated by persons suffering from plague, but, at least during the last few years, plague has failed to become established in this way. (2) A survey of rats and fleas, conducted at Mombasa upon 66 truckloads of maize in transit, resulted in no rats being seen or captured, whilst only seven fleas . . . were collected from clean white rats after they had been allowed to run about in the maize. (3) Although maize continues to be repeatedly unloaded and handled at Mombasa, this town has remained free from plague. (4) We have failed to obtain any evidence that the transport of maize from endemic centres by railway is a factor in the dissemination of plague."

W. F. H.

JOLTRAIN (Ed.). *La peste à Paris (1917-1937).* [*Plague in Paris 1917-1937.*]—*Bull. Acad. Méd.* 1936. Dec. 15. 100th Year. 3rd Ser. Vol. 116. No. 39. pp. 601-614.

History is better written after the lapse of time has allowed first impressions to become consolidated. This is most true of plague, whose very name is a source of alarm to nations. Plague in epidemic form had been absent from Paris since 1669. It made its appearance during the war, to assume epidemic proportions in 1920 with the record of 91 cases. In 1917 a steamer from India, containing sick rats sailed up the Seine and arrived at Levallois. Rats escaped from the vessel and the rat epizootic had thus its beginning. The first record of a human case was in an infant on 3rd December, 1917. One of the greatest difficulties encountered was a reliable method of diagnosis in ambulatory cases and in convalescents. This was found in the serum test by fixation of complement. In 1920, 120 cases were recorded and 91 confirmed. Of these 39 were untreated and had a death rate of 80 per cent. while 52 were treated and had a death rate of 6 per cent. Plague has continued in some degree since 1920, though mainly in rats, until 1935 and 1936, when the returns both for rat plague and human plague were nil.

Reference is made by the author to the possibility of a bacteriological warfare in the future. The idea of such an atrocious method of destruction of humanity is known to have been considered by some countries. Experiment has shown that plague bacilli, for example, can be incorporated in tear or asphyxiant gas without losing virulence, so that, if inhaled, they can give rise to plague pneumonia.

Some of the conclusions drawn are that, as soon as a suspicious case is notified it becomes urgently necessary to make an exact diagnosis and to begin at once, without waiting for the result, with intravenous serum therapy in doses of 100 to 200 cc. No delay should take place in making public the declaration of plague whatever the consequences may be. Commercial and social interests tend to oppose this declaration, and no wonder when it means subjection to the inflexible rules of the conventions of Venice and of Paris. Some countries may even make obligatory quarantine for plague the reason for refusal of entry of products from the contaminated country. The declaration of plague,

therefore, which should certainly be made obligatory, is not merely a medical question, it is an international one. All countries without exception ought to declare their cases. In practice, a country is afraid to set a good example lest other countries may not follow suit and so gain some advantage.

W. F. H.

PFISTER (C. R.). 25 Jahre Pestbekämpfung in Java. [Twenty-Five Years of Campaign against Plague in Java.]—*Gesundheit u. Wohlfahrt*. 1936. Sept. Vol. 16. No. 9. pp. 473–476.

Twenty-five years ago plague broke out explosively in Java and found the authorities unprepared. Fortunately the medical service, with its very efficient advisers, rose to the occasion. "The plague campaign began . . . in Java on the basis of house improvement . . . and has been continuously applied in the district of Malang up to the present day. Thus it has been possible for this district, of about 740,000 inhabitants, where plague deaths during the years 1911 to 1915 amounted to 22,000, to be rendered free of plague by the improvements made to 140,000 dwellings. Since 1916, except for single imported cases, no plague has occurred here." Where epidemic plague, however, has set in, this method of house improvement is too slow and methods of vaccination have to be resorted to. The method of OTTEN, which makes use of a living vaccine, has given much better results than the previously tried method with a dead vaccine. This vaccination increases the immunity of a population for a matter of 6 months, and revaccination has then to begin. Vaccination against plague, therefore, does not deal with the really causal agent of plague, the house rat. It can, however, give the technical service time to carry out the necessary and fundamentally sound house improvement. Nowhere in the world has this type of antiplague measure, by house improvement, been so systematically carried out as in Java and nowhere have the results of vaccination been so carefully investigated. "The way in which the government of the Netherlands Indies has conducted its plague campaign is . . . absolutely unique."

W. F. H.

ROSIER (H. J.). Verslag betreffende de pestbestrijding op Java over het jaar 1934. [Report on the Plague Campaign in Java during 1934.]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1936. Vol. 25. No. 2. pp. 109–209. With 24 graphs & 11 maps. [Refs. in footnotes.] English summary.

Reports of antiplague measures in Java are always interesting because they have a specialized character. The measures are two: one the policy of improvement of dwellings to make them rat proof, which is combined with periodic inspection, and the other, a more recent measure, of the use of a prophylactic living plague vaccine. In 1934 plague was epidemic and reached maximum proportions for any epidemic in the island. It is expected that a limit will soon be reached and plague begin to subside. During 1934 there were 23,267 cases of plague, of which 23,239 were fatal. This contrasts with similar epidemic figures of 16,969 and 16,881 respectively in 1933. No increase of the plague area took place in 1934 over 1933. The areas devastated were the same, but the intensity of the epidemic showed an increase. In

connexion with the efforts to eradicate plague it is especially interesting to note the incidence of plague in the several parts of Java. Anti-plague building measures have proceeded from east to west in the island and are not yet complete. In the present epidemic there were 2 cases of plague in east Java, 2,668 in central Java and 20,569 in west Java. Thus, practically speaking, although epidemic conditions prevailed, east Java remained free of plague.

Difficulties with the population which were previously encountered over the routine practice of spleen puncture for diagnosis *post-mortem* have been almost entirely overcome. Permission to puncture is seldom now refused and consequently secret burial of plague cases has become a rare event. Pulmonary plague was met with, and the cases recorded were 3,454 or 16.3 per cent. of the total. "However the pulmonary plague remained an incidental variation of the plague epidemic" and showed nowhere a special character.

Plague vaccination with living organisms was introduced towards the end of 1934 and it was decided in 1935 that systematic "mass vaccination of the whole population of the plague territories should be started." A preparatory trial of this method of vaccination was made in the last two months of 1934 and the results, which were observed up to May 1935, were very satisfactory. They seemed to show that "an immunity effect of about 90 per cent. of the inoculated population may be counted on." This is a very much better result than the 50 per cent. obtained in a test of the same kind in 1920-21 with the vaccines then in vogue.

W. F. H.

DE VOGEL (W. T.). Recherches faites aux Indes Néerlandaises sur la durée pendant laquelle la puce *X. cheopis* infectée de peste peut, dans les conditions climatologiques de l'île de Java, transmettre l'infection. —Bull. Office Internat. d'Hyg. Publique. 1936. Aug. Vol. 28. No. 8. pp. 1525-1543. With 5 diagrams (2 folding) & 1 map.

GIRARD (G.). La peste à Madagascar Récentes acquisitions tirées des recherches effectuées au cours des trois dernières années. [**Three Years of Research on Plague in Madagascar.**]—Ann. de Mite et de Pharm. Colon. 1936. Apr.-May-June. Vol. 34. N° 1. pp. 235-241.

Plague reached Antananarivo and the high plateau of Madagascar, at an elevation of 800 to 1,500 metres, in 1921. There is no reason to suppose that wild rodents play any part in its dissemination, as is the case in South Africa. Plague in Madagascar is well under control in the towns. It is in the country of the high plateau, where it makes its ravages and takes a toll of more than 2,000 victims each year. The present article deals with the researches into this problem during the last three years.

The vector flea is *X. cheopis*, which is abundant. This flea has been found by inoculation test in the guineapig to be still infective several weeks after the epizootic and in one instance for nearly three months. It is therefore not difficult to understand how plague remains endemic in Madagascar, especially as the climate of the high plateau, from the point of view of temperature and humidity, is ideal for the survival of *X. cheopis* in the dust of native huts. A new plague-transmitting flea has been discovered, *Synopsylla fonquernii*, which is found outside in rat burrows.

Notable contribution has been made from Madagascar to our knowledge of the possibility of use, the efficacy and the harmlessness of a living vaccine. It is prepared from an avirulent strain, which is called the "E.V." strain. In one district where half the population, amounting to 100,000, has been vaccinated the mortality from plague has been reduced by two-thirds and the general mortality from all causes by 50 per cent. The same avirulent living strain has also been used for the immunization of horses with a view to obtaining an anti-plague serum. These horses gradually arrive by successive inoculations at receiving two whole bottles of culture intravenously. The vaccine has to be inoculated immediately the suspension is made, in order to avoid the lysis of the germs which would set free toxin and cause a violent reaction. Titration of the horse serum furnished has shown it to be superior to the sera of the Pasteur Institute of Paris and of the Johannesburg Medical Research Institute. It has, however, not yet been sufficiently tried out in human beings. W. F. H.

DE LA BARRERA (J. M.). Peste rural. [**Rural Plague.**—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Mar. Vol. 7. No. 3. pp. 439-506. With 42 figs. & 1 map.

This study has reference to the existence of plague amongst the wild rodents of the Brazilian provinces La Pampa and Rio Negro. Human cases of plague also occurred but of very limited extent. One case was discovered in Lihuel Calel and four cases in Loventuel. The country affected is extremely sparsely populated and the wild rodents concerned make only accidental contact with man. Domestic rats were scarce in this region, which is an argument for the contraction of human plague, in the cases considered, from a species of wild rodent.

It is interesting to learn that the wild rodent, locally called "cuis" in South America, includes a number of species belonging to the genera *Cavia*, *Galea* and *Microcavia*. The species of the genus *Cavia* are the larger animals and resemble guinea-pigs. Many of the other wild rodents also were examined and there are good photographs of these animals and their burrows. Much work on biological lines remains to be done before the connexion between sylvatic plague, the plague of the domestic rat and human plague is cleared up. "If the domestic rat is the sole permanent reservoir of the virus its destruction should theoretically cause all plague to disappear; if, on the contrary, enzootic plague exists among the selvatic rodents, domestic deratization alone will not solve the problem." W. F. H.

URIARTE (L.), MORALES VILLAZÓN (N.), CRESCENTINO (H.) & ANCHEZAR (B.). Etapa de la peste hacia el Oeste Argentino (San Juan 1931, Los Alanices). [**Advance of Plague in West Argentine.**—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. July. Vol. 7. No. 4. pp. 549-567. With 2 figs. English summary.

An illustration of how slow the progress of plague may be is given by the case of San Juan in which plague made its first appearance in 1931, thirty years after the introduction of the disease in the eastern ports of the country. The disease was only recognized after the occurrence of 17 deaths from pulmonary plague. Investigation of the origin of the epidemic was difficult, but was ultimately traced to rats with the

presumption that these had been transported by the railway from Córdoba. The town of Córdoba had been "heavily infected with plague in previous years."

W. F. H.

URIARTE (Leopoldo), MORALES VILLAZÓN (N.) & ANCHEZAR (Benjamin). Neumoposte en Frias, 1934. Un caso de evolución prolongada. [**Pneumonic Plague in Frias. A Case of Long Duration.**].—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. July. Vol. 7. No. 4. pp. 705-719. With 2 figs. English summary.

The liability of influenza and plague to be for a time confused is illustrated here. In Frias, a town in the Argentine, pulmonary cases, which were diagnosed as influenza, had made their appearance. As these proved invariably fatal and were evidently highly contagious, plague pneumonia became suspected as the cause of deaths in the small village. This suspicion was confirmed bacteriologically by examination of the sputum. All of the patients, numbering 16, died with one exception in 3 or 4 days. This exception is deserving of record because of the very long duration of the illness. The patient was a young girl of 14 years whose pulmonary symptoms appeared on 10th May. "There were times when the patient showed signs of improvement but only to return to the same serious condition." Death did not take place till 10th June, a month later.

In a farm a short distance north of Frias two cases of bubonic plague occurred and these recovered. The infection of rats in this farm area was proven positive, at least 5 infected with plague out of 7 *R. rattus* and 15 *R. alexandrinus*. In Frias on the contrary the few rats examined were not infected.

W. F. H.

URIARTE (Leopoldo). Peste, pulgas y roedores agrestes. [**Plague, Fleas and Field Rodents.**].—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Nov. Vol. 8. No. 1. pp. 142-158.

The discovery of the existence of extensive plague epizootics among the essentially wild rodents in different countries of the world has raised the question whether the present fundamental prophylactic anti-plague measure of deratization should be modified. As the rat is a domestic rodent it stands in a different position from those wilder animals which make little contact with man. In South America the problem has arisen in connexion with the explanations put forward for some of the human plague, which has occurred there, as due to "cuis," which are generally describable as rodents of guineapig type. The author's contention is that whatever antiplague measures are adopted, they should be pursued methodically, with continuity and with vigour and should apply to the whole country. He emphasizes the fact that the efficacy of measures of deratization has been proven by long experience. It is problematical whether the same efficacy could be attained by extending those measures to the field rodent; moreover, if the field rodent is a factor of importance in the origination of epidemics, this probably occurs through contact with the domestic rodent. That is to say, the domestic rat still remains a link in the chain of causation of human plague. This really amounts to saying that the main prophylactic antiplague measure which is worth adoption by a community, even in the presence of "sylvatic" plague, is deratization.

W. F. H.

PUBLIC HEALTH REPORTS. 1936. Sept. 11. Vol. 51. No. 37. pp. 1279-1280.—**Plague found in Prairie Dogs (*Cynomys parvidens*) in Utah.**

Prairie dogs were first shown to be subject to plague by the demonstration of the infection in fleas taken from those animals. It is now shown for the first time "by mass inoculation of tissue material and cultures" that the disease exists in the prairie dog (*Cynomys parvidens*) in Utah. The cultures obtained gave typical reactions and the autopsy findings in inoculated guineapigs were also typical.

W. F. H.

FRICKS (L. D.). Review of Plague in Seattle (1907) and Subsequent Rat and Flea Surveys.—*Public Health Bull. No. 232*. Washington. 1936. Nov. 28 pp.

PUBLIC HEALTH REPORTS. 1936. June 26. Vol. 51. No. 26. pp. 844-845.—**Pooled-Flea Inoculations reveal Plague-Infected Areas in California.**

A method is described in this short note which might be of great use as an indication of the existence of plague infection in a district. It is the method of pooled-flea inoculation of guineapigs and was adopted originally owing to a shortage of guineapigs in the testing laboratory. Batches of fleas "sent in from the field in buffer salt solution were kept in the refrigerator for varying periods of time before inoculating them into guineapigs." These fleas had been collected from ground squirrels and in the case of three general "pools" gave rise to acute septicaemic plague in the inoculated guineapigs. One of these pools was of "33 fleas from 104 squirrels anatomically free from plague, from 3 different regions in Madoc County and inoculated into a guineapig on June 3. Animal died of acute septicaemic plague on June 10."

W. F. H.

PUBLIC HEALTH REPORTS. 1936. Aug. 21. Vol. 51. No. 34. pp. 1159-1160.—**Plague Infection discovered in Fleas and Lice taken from Marmots in Montana and in a Marmot in Utah.**

Important points of epidemiology are involved in this short report. It is to the effect that not only fleas but also lice taken from 7 ground hogs (marmots) by the staff of the Rocky Mountain Laboratory showed plague infection, as was demonstrated by inoculation into guineapigs. "Secondary inoculations and cultures gave typical plague reactions." A sick marmot was also found: it was killed and found suffering from plague. "This is believed to be the first plague-infected marmot reported in the United States."

W. F. H.

PUBLIC HEALTH REPORTS. 1936. Oct. 16. Vol. 51. No. 42. p. 1445.—**Plague Infection in Fleas taken from Ground Squirrels in San Bernardino County, Calif.**

In 1933 a human case of plague was reported and infection was thought to have been contracted in San Bernardino County, California, and another suspicious case has occurred in the present year (1936). Search has failed to find any plague-infected rodents in the

County, but in September some fleas collected from the Californian ground-squirrel, *Citellus beecheyi fisheri*, in San Bernardino County, have given rise to typical plague in guineapigs. H. H. S.

PUBLIC HEALTH REPORTS. 1936. Oct. 30. Vol. 51. No. 44. p. 1505.—**Plague Infection in Fleas from Monterey County, and the Lake Tahoe Region, California.**

The use of fleas taken from wild animals, especially of pooled fleas, is becoming a useful method for the determination of sylvatic plague. In this instance fleas collected from ground squirrels (*Citellus beecheyi*) have, by injection in guineapigs, proved the existence of plague in Monterey County. "A human case of plague was reported from Monterey County in June of this year." Again "pooled fleas taken from chipmunks (genus *Eutamias*) and ground squirrels (*Citellus beecheyi* and genus *Callospermophilus*) in the Lake Tahoe region" have proved, on inoculation, the existence of plague there.

W. F. H.

WU (C. Y.). **Rats and Rat-Fleas of Shanghai.**—*Reports National Quarantine Service Ser. VI.—1935-6.* pp. 31-41. With 8 figs. on 2 plates.

Shanghai is situated on latitude 32°N. and has a climate which is cold and damp in winter, mild and wet in spring, very hot and humid in summer, and cool and dry in autumn. "The rat population is predominantly *R. rattus* (85.5 per cent.)." Of the rat fleas caught *Leptopsylla musculi*, "the mouse flea" is relatively harmless, formed 76 per cent. of the total, and is present throughout the year. Next in frequency comes *Ceratophyllus anisus* at 17.6 per cent.; it is a spring flea. The chief vector flea, *X. cheopis*, formed only 6 per cent. of the fleas collected and was obtained only in the autumn months. "*Ceratophyllus fasciatus* is practically absent in Shanghai." Emphasis is laid on the fact that "*X. cheopis* is not a common species in Shanghai and has a definite seasonal incidence" . . . "The conclusion is arrived at that plague has never gained a firm foothold in this city nor is it likely to do so unless conditions to the north and south are radically altered or factors other than the seasonal prevalence of *X. cheopis* come into play in the future."

W. F. H.

BONEBAKKER (A.). Bijdrage tot de clinic der pest. [**The Clinical Features of Plague.**]—*Geneesk. Tijdschr. v. Nederl. Indië.* 1936. July 28. Vol. 76. No. 30. pp. 1890-1902.

Most of this article has as its theme the question whether there is any real difference between bubonic plague and plague septicaemia. The use of early blood culture and a bile medium has served to show that there is no great difference. According to the author's own summary he found as follows:—

"By observations on 250 plague patients in whom blood-bile cultures were carried out both in bubonic and septicaemic plague it appeared that:— (1) Already at an early stage of bubonic plague bacilli are present in the blood in 85 per cent. of cases. (2) In the course of bubonic plague, and indeed also in septicaemic plague, secondary buboes can appear as a result of haematogenous infection. (3) Cases of pure bubonic plague without

septicaemia are relatively rare and have a good prognosis. (4) By contact with sufferers from pneumonic plague individuals may contract either bubonic or septicaemic plague without a primary lung lesion."

W. F. H.

PUBLIC HEALTH REPORTS. 1936. Aug. 7. Vol. 51. No. 32. p. 1091.
—An Unusual Case of Bubonic Plague.

The mildness of the case of pestis minor here reported is the reason for its publication. An 11-year-old boy while cleaning a bush rabbit cut his thumb on a bone. No local infection developed, but 3 days later pain was felt in the axilla. On the 4th day the patient had headache, the pain was worse and he was admitted to hospital with temperature 104°F., prostration and an axillary bubo. Smears from the bubo apparently showed bipolar organisms and blood was inoculated into guineapigs. In a week the patient showed improvement and the temperature was normal in 10 days. The guineapig inoculated with blood a week previously died, "and smears from organs showed many typical bipolar organisms."

W. F. H.

KOROBKOVA (E.). A la biologie de *Pasteurella pestis*. [**Biology of *Pasteurella pestis*.**]—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 2. [In Russian pp. 163-184. With 7 figs. [23 refs.] French summary pp. 184-186.]

Out of 32 plague strains inoculated by stab culture in agar and kept at 11° to 28°C., 16 were found to have preserved their full vitality after 12 years. They fermented glucose, mannite, maltose and glycerin, but not lactose nor saccharose. Four of the strains fermented rhamnose just as well as *Past. pseudotuberculosis rodentium*. All the strains were agglutinated by specific serum and lysed by plague bacteriophage. Seven of the 16 strains had kept their virulence, while the rest were avirulent. In the case of *Past. pestis* it is the R strain, and not the S, which is virulent, and as R strains are very stable there is little tendency to dissociate to an S strain. One of the strains however did show dissociation into R and S forms. These S forms had smooth, transparent, viscous colonies with regular margin, gave secondary colonies, uniform turbidity in bouillon, and frequently showed a capsule. All their biochemical, agglutinating and phage properties were identical with those of the R type. The S type showed a tendency to revert to the R type.

W. F. H.

URIARTE (Leopoldo) & MORALES VILLAZÓN (N.). Conservación de la vitalidad y virulencia del *B. pestis*. [**Preservation of the Vitality and Virulence of the Plague Bacillus.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Nov. Vol. 8. No. 1. pp. 5-12. With 1 fig. English summary.

The spleen of two rats which were in a state of advanced decomposition furnished living plague bacilli after 6 days. Films from the spleen only showed putrefactive organisms, but intraperitoneal and subcutaneous inoculation in guineapigs caused death of these animals from plague. The spleen of plague-infected animals could be preserved for 12 to 19 days in a 20 per cent. neutral glycerine containing 2 per cent. calcium carbonate. In the bone marrow of experimentally

infected animals the bacillus remains alive for 12 days, and longer still if naturally infected. The original virulence of a strain of the plague bacillus may be preserved for more than two years in a phosphoric anhydride vacuum tube. W. F. H.

DONSKOW (G. D.) & LOCHOW (M. G.). Ueber den Einfluss von Alkohol auf die morphologischen, biochemischen und biologischen Eigenschaften des *B. pestis*. [**Effect of Alcohol on the Plague Bacillus.**]—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 2. [In Russian pp. 187–193. German summary pp. 193–194.]

No growth of plague took place in a bouillon to which 20 per cent. alcohol had been added. At less concentration the transference of bacilli from bouillon to ordinary media showed retardation of growth but no change in morphological and biochemical properties. A virulent strain of plague, however, exposed to the action of 10 per cent. alcohol for 30 days or 15 per cent. alcohol for 3 days was found to have lost its virulence and this virulence was not restored by subpassage in the mouse. W. F. H.

BESSONOVA (A.). **A Method for the Cultivation of Transitional-Rough (OR) Variants of *B. pestis*.**—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 2. [In Russian pp. 195–197. With 2 plates. English summary pp. 197–198.]

These transitional rough variants of the *Past. pestis* were obtained by sowing minimal quantities on blood or haemolysed blood agar. W. F. H.

BESSONOVA (A.), LENSAYA (G.), MOLODZOVA (P.) & MOSSOLOVA (O.). **Some Cases of Spontaneous Transmutation of *B. pestis* into *B. pseudotuberculosis rodentium* Pfeiffer.**—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 2. [In Russian pp. 151–162. [35 refs.] English summary p. 162.]

The close relationship of and the possibility of confusion between *Past. pestis* and *Past. pseudotuberculosis rodentium* have often been described. In this communication the authors maintain that they have observed the transmutation of four human strains of the plague bacillus and one ground-squirrel strain into *Past. pseudotuberculosis rodentium*. The proofs of this transmutation are afforded by means of simultaneous tests of each of the transmuted strains and known control strains as to: (1) their ability to show growth on agar in 24 hours, (2) their ability to give any growth at all with sowing of minimal quantities, (3) their fermentation of rhamnose, and (4) the type of the respective growths on various differential media. W. F. H.

MITIN (S. V.). Immunological Studies on Plague. V. Preparation of the Plague Vaccines A–D by Silber's Method.—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 2. [In Russian pp. 199–208. With 4 figs. English summary p. 208.]

DOPMEYER (A. L.). **Plague Eradicative Measures on the Island of Maui, Territory of Hawaii.**—*Public Health Rep.* 1936. Nov. 6. Vol. 51. No. 45. pp. 1533–1556. With 3 folding maps, 3 figs. & 4 plates.

The measures adopted in the island of Maui have essentially been those of an anti-rat campaign. Poisoning and trapping have been used. The areas cleared of rats have been chiefly field and gulch areas, which have had the brush harbourage of the rats removed by the work of labourers. Rats caught are examined macroscopically and any that are suspected of plague are examined microscopically. Mass inoculation methods are also used and the "material from not more than 10 rats is used for inoculating" a guineapig or white rat. The population of Maui is 52,000: the cost of the campaign in 1935 was approximately 122,000 dollars of which approximately 93 per cent. "was spent for labor and salaries."

W. F. H.

MOORE (Roy). **Rodent Control in Food Establishments.**—*Amer. J. Public Health.* 1937. Jan. Vol. 27. No. 1. pp. 62–66.

Red squill is a rat poison which is comparatively harmless to human beings and domestic animals. If eaten at all by the latter, it will be vomited. The aim should be in poisoning to kill all rats with one application, otherwise surviving rats become suspicious and refuse the baits. Thus it is essential to lay down abundance of baits and not to undertake poisoning operations more than two or three times a year. It is advisable to get rid, for a few days, of all the food that is available to rats in an establishment before putting out poison baits. The formulae "commonly used in the rat poisoning campaign of the Biological Survey" are:—(a) meat bait—powdered red squill of high toxicity 1; ground fresh beef uncooked 15; corn meal 1, and (b) cereal bait—powdered red squill of high toxicity 1; rolled oats of good quality 11; corn meal 1. A little water should be stirred in to make a rather moist dough.

W. F. H.

HOLSENDORF (B. E.). **Rat Harborage and Ratproofing.**—*Public Health Rep.* 1937. Jan. 15. Vol. 52. No. 3. pp. 75–81.

ALLARD (Maurice). **Dératisation d'une vieille ville coloniale (Saint-Louis-du-Sénégal).**—*Ann. d'Hyg. Pub., Indust. et Sociale.* 1936. Sept. Vol. 14. No. 9. pp. 525–553. With 10 figs.

JENSEN (GREGERS). **Et tilfælde af ratinfektion. [A Case of Ratin Infection.]**—*Hospitalstidende.* 1936. Sept. 22. Vol. 79. No. 38, (Med. Selsk. f. Fyens Stifts Forh.) pp. 73–75.

On January 1st, 1936, a Danish householder put some crusts of bread, treated with ratin, into an unlocked cupboard in the evening. Next day some of the crusts were missing, and in the evening a hitherto perfectly well boy of 16 months suddenly fell ill with violent abdominal pain and diarrhoea. The clinical picture was that of acute enteritis of a paratyphoid type, but a bacteriological examination of the stools revealed a pure culture of Gärtner bacilli of the ratin type. They behaved in every respect as did the bacilli cultivated from the bread which had been treated with ratin. By January 17th all pathogenic intestinal bacteria had vanished, but Gärtner bacilli of the ratin type

were agglutinated in a dilution of 1 in 800. Typhoid, paratyphoid and Bang's bacilli were not agglutinated. The child was very ill for a couple of days, but had recovered completely after six days.

Ratin can be bought of Danish chemists, the preparation being "authorised," and its sponsors being in touch with the State Serum Institute in Copenhagen. Only one strain is used, the so-called arabinose-positive Gärtner bacillus. In 1931, Martin KRISTENSEN and Knud BOJLÉN of the State Serum Institute published a study of ratin infections in human beings, giving an account of ten outbreaks of acute gastro-enteritis in which the stools yielded Gärtner bacilli of the ratin type. In one case the infection terminated fatally. On the same occasion, FLY recorded the case of a would-be suicide, aged 28, who swallowed a 170-gram bottle of ratin. The violent, febrile gastro-enteritis, which developed in the course of about 10 hours, ended in recovery after about a week. Since then, 17 new cases have been observed in Denmark, and the vendors of ratin have several times changed the instructions concerning its use. They now recommend its handling only by their own employees, if possible. Some 50,000 deposits are made by them every year in Denmark.

C. Lillingston.

THIERFELDER (M. U.). De organisatie van de vaccinatie tegen pest met levend vaccin volgens Otten. [**The Organization of Anti-plague Vaccination with Otten's Living Vaccine.**—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Sept. 15. Vol. 76. No. 37. pp. 2325-2338.

An immunity of 90 per cent. is claimed for living plague vaccine: that is to say, for every 100 deaths among the non-vaccinated there should be only 10 deaths among the vaccinated. It would have been desirable to test statistically the duration of the immunity conferred, but, with a success of the order claimed, it was clearly not justifiable to withhold protective vaccination from a population which was at risk. Many difficulties arise, if this type of vaccination is to be carried out on a large scale. The vaccine itself is a living vaccine, has to be very carefully prepared and cannot, because it is living, be stored for too long a time. It could not, moreover, be made in indefinitely large quantities. Then, too, the arrangements for any large scale inoculation must not be too disturbing to the life and work of the people concerned. Two dilutions of the vaccine were used, one of 1.5 agar culture per cc. in adults and one of 1-10 agar culture for children under 12 years. The dose was 1 cc. Abscess formation, although not unknown, occurred only to the extent of about 80 cases per 1,000,000 inoculated. Another very important arrangement, which reduced greatly the speed of inoculation and the numbers which could be dealt with daily, was the need for exact registration of those vaccinated. These and other difficulties were surmounted and it was possible, in the selected regencies of Bandoeng and Soemedang, to inoculate 1,049,533 persons of their own free will out of a total of 1,149,273, or 91.3 per cent. There were few contra-indications to vaccination. Exceptions were:—children under 3 months, persons with extensive skin disease or with fever and those who were seriously sick or debilitated. Pregnancy, except in the last month, was not a contra-indication.

The question of revaccination arose and, as no exact facts were available as to the duration of immunity, it was decided to carry out

this procedure for each native village or dessa according to the occurrence weekly of a given number of plague deaths. Especial notice was taken of whether cases were of bubonic or pulmonary type. All the preparations for revaccination were practically identical with those of the primary vaccination. W. F. H.

OTTEN (L.). Immunization against Plague with Live Vaccine.—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 73–101. With 1 graph. [42 refs.]

Otten's work with dead and live plague vaccine has attracted much attention because it deals with the very fundamental question of the best and safest method of immunization of human beings. It has been already considered (this *Bulletin* 1934, Vol. 31, p. 35 and 1936, Vol. 33, pp. 364–365). His conclusions in this article set out the present position for the live vaccine. They are that: (1) Experiments on wild rats and guineapigs with the live, attenuated strain "Tijwidej" gave results much superior to those which have been obtained with dead vaccine. (2) Investigation of a number of strains, 5 to 15 years old and preserved in stab culture at 5°C., yielded avirulent variants even when the parent cultures still remained virulent. (3) This loss of virulence was not correlated with age of the culture nor could it be said to belong to any special alteration in the form of colonies. (4) Avirulent variants might show great differences in antigenic potency, as was proved by animal test; some had high immunizing value and some almost none. (5) Immunizing properties are dependent on more than one antigen. Two of these could be demonstrated by animal experiments; one produced the highest degree of immunity in rats, the other in guineapigs. (6) By tests in the field with application of an alternate case method it appeared that mortality from the bubonic form of plague in man can be reduced to 1/10th. (7) A mixed vaccine containing the strains which have special efficacy in rats and in guineapigs respectively might have even better results. (8) What applies to these avirulent variants of the plague bacillus may apply to other organisms, which are used as vaccines. W. F. H.

URIARTE (Leopoldo) & MORALES VILLAZÓN (N.). Sensibilidad e insensibilidad a la peste de algunos animales. [**Susceptibility and Non-Susceptibility to Plague of Some Animals.**]—*Rev. Inst., Bacteriológ.* Buenos Aires. 1936. July. Vol. 7. No. 4. pp. 720–726. English summary.

Two rodents *Graomys griseoflavus griseoflavus* and *Lagostamus maximus immolis* proved very susceptible to plague. Another wild animal the "peludo" (*Chaetaphractus villosus*), a species of armadillo, was practically insensible to plague in large doses, even intraperitoneal. W. F. H.

BHARGAVA (R. C.). Notes on Plague.—*Jl. Indian Med. Assoc.* 1936. Sept. Vol. 5. No. 12. pp. 736–742. [59 refs.]

CHOLERA.

PANDIT (C. G.), RICE (E. Milford) & NEAL (W. J. L.). **A Statistical and Bacteriological Analysis of a Cholera Epidemic in Manipur State, Assam.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 37–64. With 1 map & 1 graph.

Considerable care has been taken in the analysis of this cholera epidemic to take into account all the usual statistical characters which affect the final presentation of data. The epidemic affected a population "which is homogeneous from the standpoint of caste and customs." In the analysis of the data due note is taken, in the three groups, (a) no treatment, (b) bacteriophage treatment, and (c) essential oil treatment, of (1) age and sex distribution, (2) the possibility of inclusion of all fulminating cases in the no treatment group, (3) psychological factors likely to operate with any form of treatment as against no treatment, (4) the preference of the population for any one form of treatment, (5) the significance of the results obtained at the time when treatment and no treatment were all in use together, and (6) the possibility that the total case incidence was not really representative of the area involved by reason of "missed cases" in the untreated group. If we take the results obtained at a time when both essential oils and bacteriophage were being used and compare them with the untreated group of the same period we find that the mortalities were 87·1, 36·4 and 37·1 per cent. for no treatment, bacteriophage and essential oil treatment respectively.

A bacteriological investigation showed that the strain of vibrio isolated in the epidemic was typically agglutinating and that variations in agglutinability became noticeable towards the end of the epidemic.

W. F. Harvey.

PANDIT (C. G.) & RICE (E. Milford). **An Epidemic of Cholera in Mondair Village (Habiganj Subdivision, Assam).**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 65–71. With 1 map & 1 graph.

The epidemic broke out in Mondair village with a population of 751 and resulted in 65 attacks with 33 deaths. A sufficient stock of bacteriophage was available in the village for the treatment of early cases. It is in some ways unfortunate that no really statistical comparison can be made in this case between treated and untreated owing to the small numbers of the untreated and to the fact that many of those receiving bacteriophage suffered from diarrhoea but were not recorded as cholera cases although they were subsequently proved to be such by agglutination tests. The figures were, 55 cases treated by bacteriophage with 27 deaths and 7 untreated with 3 deaths. Some cases are omitted for good reasons.

The authors finally say that "in view of these findings it would be premature to say in the present state of our knowledge, that bacteriophage had absolutely no effect in altering the character of the epidemic in some ways."

W. F. H.

BOZMAN (C. A.) & LEWIS (E. G.). **An Enquiry into an Outbreak of Cholera in Burma with Special Reference to the Value of Preventive Inoculation.**—*Indian Med. Gaz.* 1936. Nov. Vol. 71. No. 11. pp. 647–651.

Mass preventive inoculation with anticholera vaccine in a dose of 1 cc. was used. Many tables of figures are given and a statistical test applied to these, "shows that in no table where the expected frequencies are sufficiently large can inoculation be said not to be positively associated with exemption from attack" . . . "It must be pointed out, however, that before a reliable estimate can be made of the degree of protection afforded, by a measure such as preventive inoculation, it is necessary that fuller particulars of the population at risk should be available so that the homogeneity of the material may be investigated."

W. F. H.

BERNARD (Noël). Le choléra dans les colonies françaises. [**Cholera in the French Colonies.**]—*Ann. de Méd. et de Pharm. Colon.* 1936. April–May–June. Vol. 34. No. 2. pp. 177–215.

The author insists on the commonly held view that cholera has had its permanent and primary home in British India for 25 centuries, according to the most ancient authorities. It spreads east and west from this focus. Europe has developed measures which have effectively put an end to the pandemic spread of cholera and so has Japan. French Indo-China, owing to its extensive land and sea frontiers has found it impossible to prevent the advent of cholera within its borders, where the history of each invasion has been—one year of importation of infective germs, a period of several years in which many foci make their appearance, and a period of disappearance. The extension of infection is ascribed to interhuman contact and to transportation by water and flies. This menace of cholera is avoidable and must be met by notification, isolation, disinfection, sanitary inspection, education of the public, general hygiene and preventive medicine. Prevention is best attained by the provision of a good water supply and by vaccination. W. F. H.

DOORENBOS (W.). Le choléra. Conceptions nouvelles sur les principes fondamentaux de l'épidémiologie et de la prophylaxie du choléra. [**Cholera. New Conceptions. Epidemiology and Prophylaxis.**]—*Rev. d'Hyg. et de Méd. Préventive.* 1936. Oct., Nov. & Dec. Vol. 58. Nos. 8, 9 & 10. pp. 595–617; 675–697; 736–757, & 1937. Jan. & Feb. Vol. 59. Nos. 1 & 2. pp. 22–50; 105–121. With 5 figs. [69 refs.]

In this series of articles we have an analysis of factors relating to the epidemiology and pathology of cholera as an infectious disease, as well as of certain phenomena designated by the author equilibrium and dysequilibrium of vibrio characters. This question of equilibrium in an epidemiogenic sense turns on the thesis of a critical virulence for every virus and on the susceptibility of the individual attacked. The transmissibility of a disease is correlated with organismal virulence or power to multiply and the gravity of symptoms with toxigenic power. These factors may be entirely independent. Disproportionate development of one may lead to actual diminution of the other—to dysequilibrium and to development of an "incomplete" virus. An important conception in this theory is that of the "microbe of sortie,"

stimulated into activity by other species of microbes. It is thus that proteus, enterococcus, colon and dysentery organisms may become the mobilizing factor in the appearance of latent cholera. It may be necessary in the prophylaxis of cholera to combat, not only the specific virus but the non-specific factors favourable to its regeneration.

For half a century bacteriologists have been arguing over what is the true cholera vibrio: all attempts to define it appear to have failed. This is largely due to the continuous record of atypical vibrios, vibrios which may be too long, too short, not sufficiently agglutinable, haemolytic and so on. "It becomes more and more evident that the atypical vibrios are none other than modified cholera vibrios . . . The word atypical is not exactly suitable. Atypical vibrios can under certain conditions become typical." Nor is the term atypical applicable to the cholera organism only. It applies also to the clinical condition and to the epidemiology of cholera. "It is, for example, impossible to recognize clinically a premonitory diarrhoea, or even a slight case of cholera." Epidemiologically it is found that in the earliest manifestations of cholera, when they are only suspect, the medical authorities tend to have resort to fantastic explanation of the occurrence: paracholera, pseudocholera, gastroenteritis or even ptomaine poisoning. This then is the reason why "true cholera always precedes official cholera." There are exceptions to this train of events. Thus in 1930 the pilgrimage to Tor was declared affected with latent cholera "because the laboratory had found an agglutinable vibrio among the pilgrims, although no indication of clinical cholera was manifest."

The so-called peculiar attributes of the "true cholera vibrio," naturally, receive special attention. But these have undergone continuous change in the direction of greater and greater specific characterization. The order and nature of the change may be given as:—(1) appearance of the cultures on gelatin and production of indole; (2) production of indole and virulence for the guineapig; (3) agglutinability and Pfeiffer's phenomenon; (4) serological reaction and haemolytic power. A cholera vibrio, in order to be truly official, must now be specifically agglutinable and non-haemolytic. Non-conformity with these specifications in vibrios, found to be actually cholerigenic, has led to the introduction of a hypothetical disease called "paracholera." A chemical turn to the characterization of the true cholera vibrio has also been introduced by regarding the true group as possessed of a certain protein and a certain polysaccharide, but the fact that vibrios can change their chemical composition and pass into another group shatters this particular conception of specificity. A "complete" cholera vibrio, according to the author possesses three characters: (1) agglutinogenic power, (2) power of absorption of agglutinins and (3) agglutinability. "Incomplete" vibrios do not possess all these characters.

Antigenic structure, naturally, in view of the intensive work which has been done on the cholera vibrio comes in for consideration. Now, the cholera vibrio has only one flagellum. It might be expected therefore that the H, or flagellar, or thermolabile antigen would be deficient. It has been shown that, although labile by comparison with the O antigen, the H antigen can withstand heating at 60°C., so that sera prepared with suspensions killed at this temperature contain both O and H agglutinins. Contrary to what obtains among salmonella organisms the cholera H antigen is non-specific and the

O antigen is specific. Unfortunately, heating suspensions of cholera vibrios at 100°C. for 2 hours, while it destroys the H antigen and leaves the O antigen, brings out another O antigen which is non-specific. But this is not all, for serological tests have established that three different types of cholera vibrio exist, each possessing the specific O antigen, but also another O antigen specific to itself alone. This division into three types has long been maintained by Japanese workers. A remarkably high degree of specificity in testing cholera vibrios is obtainable by using living organisms in normal salt solution, performing the agglutination test at 37°C., exacting rapid and complete agglutination and using sera of relatively low titre. Researches in this direction have demonstrated the identity, at least in antigenic structure, of the El Tor vibrio and the cholera vibrio. Still more recent research, the basis of which has been the prolonged action of chloroform on the cholera vibrio, appears to show that O agglutinability diminishes and H agglutinability increases with this treatment. These observations go to prove that "the antigenic difference between agglutinable and non-agglutinable vibrios is not as great as one was inclined to maintain. In fact there is no impassable gulf fixed between these two classes of vibrios, which can be transformed the one into the other in the course of an epidemic . . . There is, if we carry the serological test to its limit, not one single vibrio which is identical with any other." May we not conclude then that "there is an error in our conceptions of the absolute value of serological characters invented for the identification of the true cholera vibrio?" These observations lead to the conclusion, largely based on the examinations conducted at Tor, that: (1) If a vibrio is to be cholerigenic it must be agglutinable. (2) The clinical syndrome of cholera can be provoked both by agglutinable and non-agglutinable vibrios, but only agglutinable vibrios give rise to transmissible cholera.

In the 3rd chapter of this memoir the author treats thoroughly of the El Tor vibrio. It is the vibrio type which is most concerned with the problem of the cholera of the Hedjaz and its transport into Egypt. In this chapter likewise there is brought out what is the author's conception of the epidemiology of cholera. The idea that there is but one true cholera vibrio "is quite insufficient to explain the different clinical and epidemic manifestations of the disease . . . Epidemic carriers can sow the seeds of disease in intermediate countries by deposit of the 'incomplete' specific virus. These intermediate countries between India and Europe are situated in the near East; the Hedjaz and Iraq can function as 'relays' of cholera. Then Turkey and the Balkans are endangered and from these again Egypt and Europe may be contaminated . . . The observations related prove the fact, which is generally accepted, that the danger of propagation and outbreak of cholera resides primarily in sick individuals, among whom there may be unrecognized cases of cholera."

W. F. H.

TAYLOR (J.). Recherches sur le choléra dans l'Inde. [*Cholera Research in India.*]—*Bull. Office Internat. d'Hyg. Publique*. 1936. Oct. Vol. 28. No. 10. pp. 1905-1908.

In these important cholera researches which are being carried on in India it has been recognized that it is absolutely necessary to work on a uniform basis, especially in serology and to have personal contact

among the workers. The O antigens are made the subject of special study and that requires pure O sera. As antigens, certified desiccated Inaba and Ogawa strains, the Japanese "original" and "variant," were obtained and sera made to these. Up to the present no vibrio strains of the type Ogawa have been isolated in India. During inter-epidemic periods in Bengal many strains isolated from cases of clinical cholera were non-agglutinating and were tested. It was found that while some of these strains belonged to the O groups 2 to 6 of GARDNER and VENKATRAMAN, most of them were of another type. Moreover, vibrios belonging to these latter serological groups, other than the group O, were also isolated from healthy carriers and from external sources.

It is important for those engaged in the manufacture of cholera vaccine on a large scale, and perhaps still more for the authorities who wish to have a supply in readiness for emergency, to learn that good evidence now points to its retention of potency for at least a year instead of the 6 months which has been allowed hitherto.

W. F. H.

LINTON (Richard W.), MITRA (B. N.) & MULLICK (D. N.). **A Study of the Metabolism of Two Hundred and Ten Vibrio Strains.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 317–321.

Previous work by the authors (this *Bulletin*, 1936, Vol. 33, p. 375) had shown the existence of a relation between the chemical groups of the vibrios and their metabolic activity. The present study is an extension of that work and has special reference to rate of respiration and the presence or absence of aerobic glycolysis. A great range of vibrio strains was used, from cases of cholera, contacts, carriers and the water of tanks. Case and contact vibrios were found to come within the range of metabolic activity characteristic of groups I and VI: carrier strains within that of groups IV and V, while tank water vibrios occupied group III. It is to be emphasized that "ranges widened with the greater number of strains studied" so that the several groups could not be differentiated by metabolic activity alone: these groups, however, can be "readily differentiated by chemical analysis." "It is highly probable that these correlations between source, chemical structure, function in the cholera problem, and metabolism are real On this basis, case and contact vibrios possess protein I, carrier and water vibrios protein II."

W. F. H.

LINTON (Richard W.) & MITRA (B. N.). **Vibrio Polysaccharides.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 323–330. [12 refs.]

The authors summarize their work "on the separation of sugars by yeast fermentation, on the identification of polysaccharides in peptone water cultures and on the acetyl polysaccharides of the vibrios." The methods used by them are given in some detail and special attention is paid to the possibility that some constituent of the nutrient agar was contaminating the vibrio polysaccharides. This possibility was, however, excluded. "It is shown that all three types of vibrio polysaccharide exist in the cell as acetyl compounds The acetyl and deacetyl forms of each polysaccharide type differ in

their specific rotations from each other and from the two forms in the other types. All appear to be nitrogen-containing sugars, with about 3 per cent. of N and about 0.6 per cent. of amino N." W. F. H.

POLLITZER (R.). **Further Observations on Cholera-like Vibrios.**—*Reports National Quarantine Service Ser. VI.—1935-6.* pp. 70-81. With 2 graphs.

As regards seasonal incidence of water vibrios the conclusion is drawn that too much stress should "not be laid upon slight differences in the incidence of water vibrios during the winter months" and that "probably the incidence of these vibrios during the warm season might be of value in forecasting the appearance of cholera."

A special study was made of an unselected series of 100 water vibrio strains with reference to the two blood reactions, haemodigestion and haemolysis, and the reactions of HEIBERG with the 3 sugars saccharose, arabinose and mannose. It is noted that "Heiberg's material appears to have consisted of non-agglutinable vibrios isolated from human stools rather than of water vibrios." In the present research no significant relationship could be made out between the blood reactions of the water vibrios tested and the reactions with HEIBERG's three sugars. It is especially noteworthy that the large proportion of 32 per cent. of the Shanghai water vibrios belonged to HEIBERG's group I, which is of the true cholera group. A comparison of these 32 vibrios, belonging to HEIBERG's group I as regards their blood reactions, and their ability to curdle milk places 5 strains near to the cholera group—of no haemodigestion, no haemolysis and late or no curdling of milk—and 6 in the El Tor group, in which vibrios are positively haemolytic, do not digest blood and may show curdling of milk in 3-7 days or not at all.

In the case of examination of stool samples from out-stations it was found best to have these samples inoculated on the spot into peptone water of pH 8 and then transmitted by post. It is noted that quite a large proportion of *Bact. morgani* No. 1 was isolated from these samples, but that the 3 actual vibrios isolated were not agglutinable by an anti-cholera serum. W. F. H.

WHITE (P. Bruce). **Lysogenic Strains of *V. cholerae* and the Influence of Lysozyme on Cholera Phage Activity.**—*Jl. Path. & Bact.* 1937. Jan. Vol. 44. No. 1. pp. 276-278.

Much of this work has reference to cholera phage \mathcal{L} , a recently isolated phage, said to be probably rare and of low lytic power. The strain now available has been renamed phage \mathcal{LL} ($\mathcal{LL}\phi$) as it differs in certain important respects from the originally described and now lost $\mathcal{L}\phi$. The activity of $\mathcal{LL}\phi$ "has been found limited to certain strains of *V. cholerae* and has as a rule been feeble." It tends to become progressively more feeble by passage in peptone water cultures, but "it has been found that egg-white lysozyme (egg-white used in 1:25 concentration), itself without appreciable effect on the growth of the normal cholera vibrio, so enhances the activity of $\mathcal{LL}\phi$ that visibly active filtrates may be obtained with regularity." Experiments with egg white showed that \mathcal{LL} -resistant strains of "agglutinable" cholera vibrios appear to be invariably lysogenic and are infected with $\mathcal{LL}\phi$. This new cholera phage \mathcal{LL} , instead of being rare, is probably the most

frequently occurring of Indian cholera phages. It is probable that it is a new and hitherto unrecognized entity and that "all the cholera phage type filtrates in currency are contaminated with *ℓℓφ*: many certainly are." It was, however, found that Chinese and Japanese strains of *V. cholerae* were *ℓℓ*-free and *ℓℓ*-sensitive but that, once exposed to this phage action, "they became like the Indian strains inveterately lysogenic." A series of typical El Tor strains, on the other hand, "and a number of non-cholera vibrios were found to be neither infected with nor susceptible to *ℓℓφ*."

Although the *ℓℓ* phage gave no visible evidence of action on rough *ℓℓ*-free races of *V. cholerae*, it was found to multiply indefinitely on R cultures "which, like those of the S form, became lysogenic."

"Cholera phage *ℓℓ* is fixed and inactivated by the polysaccharides of S, R and ρ *V. cholerae* and probably has a specific affinity for the substance" named C_γ (WHITE, this *Bulletin*, 1936, Vol. 33, 861). Where no specific polysaccharide affinity existed lysozyme did not enhance bacteriophage activity.

One further point is raised with respect to *ℓℓ* phages. It is that the least active strain is capable of immediately rendering an originally sensitive vibrio resistant in perpetuity to the most active. The explanation given of this phenomenon is that the less lytic phage establishes itself on the "phage receptors" of the sensitive vibrio and thus blockades it to the action of the more destructive strain. The term "blockade immunity" is suggested for this phenomenon.

W. F. H.

COMBIESCO-POPESCO (Cornelia) & COCIOBA (Ion). Sur les propriétés fermentatives des vibriens. [*Fermentations of the Vibrios.*]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 2. pp. 151-153.

Altogether 107 strains of vibrios were studied for their action on glucose, maltose, mannite, saccharose, dulcitol, mannose and arabinose after determination of their agglutinability to antiserum of a vibrio of group I "O" [GARDNER and VENKATRAMAN (this *Bulletin*, 1935, Vol. 32, p. 769)]. The results obtained were:—(1) all agglutinable vibrios from cases of cholera belonged to group I of Heiberg (this *Bulletin*, 1934, Vol. 31, p. 898)—59. (2) Of the non-agglutinable vibrios, those derived from definite cases of cholera, were distributed between Heiberg's groups I and II—15; (3) none of the paravibrios fermented any of the three sugars, mannose, arabinose or saccharose and belonged therefore to Heiberg's group VI—7; (4) El Tor vibrios isolated in 1930 and not agglutinable by serum I "O" were placed in Heiberg's groups I, II, III, IV.

A classification based on the fermentation of the 5 sugars, glucose, maltose, mannite, saccharose and dulcitol is not practical because it does not allow of differentiation between agglutinable and non-agglutinable strains.

W. F. H.

TAYLOR (J.), READ (W. D. B.) & PANDIT (S. R.). *Fermentation Reaction of Vibrios.*—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 349-356.

An examination is made by the authors into the relative merits of serum and chemical methods for differentiation of cholera vibrios. The chemical methods are those especially advocated by HEIBERG

(see above). In the summary it is stated that:—(1) "Heiberg's finding that vibrios agglutinable with cholera high titre serum of type 'O' group I always produce acid from mannose and saccharose and not from arabinose has been confirmed (2) The same reactions were given by 26.8 per cent. of inagglutinable vibrios isolated from human sources including cases and carriers and by 11.4 per cent. of vibrios isolated from water. (3) It is concluded that the fermentation tests with these three sugars will not provide the accurate information as to the characters of vibrios which can be obtained by serological tests."

W. F. H.

GROSSMANN (H.). Ueber den pH-Verlauf bei der Vergärung von Kohlehydraten (Alkoholen) durch Cholera- und El Tor-Vibrien. (Beitrag zur Frage der Differenzierung dieser Keime.)—*Ztschr. f. Hyg. u. Infektionskr.* 1937. Jan. 2. Vol. 119. No. 2. pp. 225–232. With 3 figs.

LINTON (Richard W.), MITRA (B. N.) & SEAL (S. C.). **Agglutination in the Vibrios. Part I. The Effect of Heat on Chemical Structure and Surface Potential.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 19–35.

Vibrios, like many other organisms, are regarded as made up of a heat-labile H antigen and a heat-stable O antigen. The work here undertaken was an attempt to determine the actual change brought about in vibrios by heat. "It follows from the double antigen hypothesis that the 'H' antigen, either whole or disintegrated, is to be found in the surrounding fluid after boiling, while the material remaining in the organisms themselves represents the 'O' antigen." In their summary of the results obtained the authors say: "The immediate effect of heat is to raise the surface potential and this change is correlated with the appearance of amino-nitrogen in the supernatant fluid. The long range effect of heat is to bring about a mild hydrolysis of the protein and the progressive removal of the polysaccharide from the vibrios. Both of these effects are concerned in bringing about the complex phenomenon known as destruction of the 'H' antigen."

W. F. H.

LINTON (Richard W.), MITRA (B. N.) & SEAL (S. C.). **Agglutination in the Vibrios. Part II. The Effect of Salt and Sera.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 331–348. [14 refs.]

This communication represents "a first approach to the problems of vibrio agglutination on physico-chemical grounds." It is based on the present-day conception that specific agglutination of bacteria is a sensitization of the organisms by antiserum and that their equally important non-specific flocculation is an ordinary colloidal reaction dependent on "the surface potential and on the cohesive force of the sensitized organisms." Either of these reactions may be brought about separately. Much variation occurs among the individual strains as regards potential, but it has not been found possible to differentiate the vibrio chemical groups by cataphoresis. "The conception of 'fit' as a decisive factor in the degree to which reaction will occur is put forward as a suggested explanation of the cross reactions so commonly found between vibrios of different chemical structure." Some interesting points regarding the effects of sera on

surface potential and agglutination are set out. Thus: (1) "Immune serum itself has a charge-reducing effect which varies directly with the content of agglutinins" and, if the serum be of high titre, flocculation may occur even when the salt solution is of very low concentration. (2) "Cataphoresis is a more sensitive technique for determining antigen-antibody reactivity than flocculation." (3) "The reason for the increased stability of rough strains in low saline concentrations is" that "at these concentrations the potentials are much higher than in 'normal saline,' the repulsive force between the individual organisms is increased and the suspension remains stable."

W. F. H.

- i. BARBER (Cella). Contribution à l'étude de la composition chimique des cendres des bactéries (vibrions cholériques). [**Chemical Composition of the Ash of Cholera Vibrios.**—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 64-65.
- ii. DAMBOVICEANU (A.) & VASILESCO (C.). Contribution à l'étude de la composition chimique (cendres) des bactéries (vibrions cholériques). [**Chemical Composition of the Ash of Cholera Vibrios.**—*Ibid.* pp. 65-68.

i. The variation in ash of vibrios may be as considerable as from 3.92 to 13.5 per cent., and this applies to both cholera and parcholera vibrios. When the percentage was high (8-13.5) there was usually percentage increase of the potassium (0.63-0.45), of the sodium (1.25-2.64) and of the phosphorus (1.60-2) and a corresponding percentage diminution of calcium (0.04-0.06). Vibrios with low ash (3.92-4.80 per cent.) are richer in calcium salts (0.11-0.14) and poorer in salts of potassium (0.25-0.35), sodium (0.7-1) and phosphorus (0.9-1.4). It has also been found that it is the vibrios with high ash that are also most strongly agglutinated by acids and by trypanflavine and have a higher electric potential.

ii. A study was undertaken of the influence of the mineral composition of the medium on the mineral composition of the bacteria grown upon it. As a result of careful analysis the conclusion arrived at is that:—Vibrios are usually organisms whose ash is greatly influenced by the salt content of the culture medium. Modifications in the composition of the ash are specially noticeable in those organisms which are poorest in mineral constituents.

W. F. H.

POLLITZER (R.). **Antigenic Structure of *V. cholerae*.**—*Reports National Quarantine Service Ser. VI.—1935-6.* pp. 57-69.

This article sets out in considerable detail the well-known work of investigators into the antigenic structure of cholera and cholera-like vibrios. It concludes with a very cautious reference to the possibility of "transmutation of cholera-like vibrios into true type under natural conditions" and to the possible necessity of revising the current ideas on the home of cholera and its endemicity.

W. F. H.

MITRA (B. N.). **The Absorption Spectra of the Proteins of *Vibrio cholerae* and Related Organisms.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 5-12. With 7 graphs.

The author finds that the absorption spectra of the two types of vibrio proteins are different and that this method affords a suitable means for their differentiation.

W. F. H.

MITRA (B. N.). **Nucleic Acid of Proteins of *Vibrio cholerae* and Related Organisms.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 1-4.

The types of protein in cholera vibrios are two and are obtained by the method of racemization. In them certain amino-acids are differently distributed in respect of their configuration positions. It was with a view to classification of vibrios that the study of their nucleic acid was undertaken. Actually the acids obtained from both types of protein were mixed together. The author's conclusion is :—
"The presence of cytosine and uracil and the absence of thymine in the nucleic acid of the vibrio proteins point to the conclusion that the acid has the pyrimidine constitution of a plant and not of an animal nucleic acid."
W. F. H.

WHITE (P. Bruce). **Differential Fixation of Cholera Phages by Extracts of *V. cholerae*.**—*Jl. Path. & Bact.* 1936. Nov. Vol. 43. No. 3. pp. 591-593. With 3 figs. on 1 plate. [15 refs.]

The range of action of certain bacteriophages has been found to be closely related to the possession of certain antigens by the sensitive bacteria. Now the A type of cholera phage attacks only true *V. cholerae* and the true El Tor vibrio. Some A phages, however, fail to attack strains of the Inaba type of cholera vibrio. The A cholera phage stands entirely alone in lysing only the S form. Expressed in other words, this is to say that, the A type cholera phage "only lyses strains possessing the type-specific polysaccharide-containing antigen of the cholera and El Tor vibrios." It was easy, then, to show that the A type phage could be differentially inactivated by the smooth, protein-free, polysaccharide, specific substance of the cholera and El Tor vibrio. "The polysaccharides derived from vibrios of other serological groups and from R and ρ races of *V. cholerae* had no inhibiting action on the A type cholera phage."

Lipoid constituents of the cholera vibrio, possessed of neither protein nor carbohydrate, were now tested for their relations to cholera phages. These were without action on phages A and D but exercised strong inhibitory action upon phages C, E, F, G, H and J.

"To sum up : it is probable that one cholera phage (A) is specifically bound by the smooth polysaccharide of *V. cholerae* . . . while certain other cholera phages (notably C, E, G and H) are fixed by and possibly make their first attack on the 'lipoid' constituents of the vibrio."

W. F. H.

PANDIT (C. G.), MAITRA (N. M.) & DATTA ROY (B. K.). **On Inhibition of Individual Types of Cholera Bacteriophage by Vibrio Extracts.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 13-18.

It has been shown that the phage-inactivating agent of a bacterial extract is of the nature of a polysaccharide. The present study was intended to demonstrate this type of inhibition by vibrio extracts on vibrio phages and was so far successful, although "no definite correlation was obtained between phage type resistance and corresponding type inhibition." Three groups of extracts were obtained and these corresponded generally to the polysaccharide groups for vibrios.

Indeed the polysaccharide nature of vibrio strains can apparently, to some extent, be determined by the nature of the inhibition produced by their extracts.

W. F. H.

JADIN (J.). Le bactériophage anti-cholérique. [*Anticholera Bacteriophage*.]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 27. pp. 297–299.

A close examination has been made by the author of the behaviour of the vibrios cholera and El Tor to a cholera bacteriophage. Whereas this bacteriophage was active for cholera in a dilution of 10^{-8} and, after several subcultures in a dilution of 10^{-10} , it was very much less active for El Tor, which could scarcely be inhibited at 1–1,000. When the bacteriophage was maintained in culture for several months on the cholera vibrio, its activity was heightened for that vibrio, but was no more than preserved for El Tor. If on the other hand it was maintained in culture on El Tor its activity was not adversely affected for the cholera vibrio. Another point, which emerged from those experiments, was that heating of the bacteriophage for 30 minutes at 64°C . did not influence its inhibitory action on cholera but abolished its anti-El Tor action. This bacteriophage could be adapted to a temperature as high as 75°C . and, curiously enough, the action on El Tor which was initially abolished by heating reappeared. Lastly, if successive reinoculations of the bacteriophage are made in an El Tor culture in the extreme dilution of 10^{-8} , at which the phage is still capable of inhibiting the cholera vibrio, but has no effect on El Tor, it becomes active against El Tor vibrios. This shows that, when the phage has multiplied sufficiently, it is capable of inhibiting El Tor vibrios. Thus the conclusion may be drawn that the real difference shown by the two vibrios in their behaviour to cholera phage is one only of their own relative sensitiveness to its action and not of the complex composition of the phage.

W. F. H.

SHILLONG: KING EDWARD VII MEMORIAL PASTEUR INSTITUTE & MEDICAL RESEARCH INSTITUTE, 19TH ANN. REP. FOR YEAR ENDING 31ST DEC., 1935 [ANDERSON (L. A. P.), Director]. pp. 6–13.—**Cholera (Bacteriophage) Enquiry under the Indian Research Fund Association.**

There is discernible an altogether hesitant note about the value of bacteriophage control of cholera in this report. The control areas of Nowgong and Habiganj do not seem to be furnishing unequivocal results, possibly because "during an epidemic bacteriophage is being widely used . . . along with preventive inoculation and other measures In these circumstances, it is difficult to assess the value of bacteriophage as the sole measure in the prevention and control of cholera in the experimental areas If, however, the bacteriophage control has been effective in Nowgong it is reasonable to assume it should be effective in Habiganj also. A study of the epidemic in the Surma Valley does not show conclusively that it had been so."

Some interesting results have been obtained regarding the keeping properties of bacteriophage. Peptone water is the best medium for preservation and "all types retain their potency longest when kept in cold storage." It has been found that types A, B and C are relatively resistant to heat and can be kept in the plains. Several

of the other types, however, are much more sensitive so that "under present conditions of manufacture and storage it is probable that 6-9 months is the limit up to which therapeutic phage will retain full potency unless stored in the cold." The "K" type tends to die out quickest.

W. F. H.

BOULNOIS. L'efficacité du bactériophage dans le traitement et la prophylaxie du choléra à Chandernagor. [**Efficacy of Bacteriophage in Treatment and Prophylaxis of Cholera at Chandernagore.**]—*Rev. Méd. et. Hyg. Trop.* 1936. May-June. Vol. 28. No. 3. pp. 179-184.

Measures to test the efficacy of bacteriophage were easy to apply in Chandernagore, which is a small territory of 10 square kilometres and a dense urban population of 25,000 inhabitants. It was possible to administer bacteriophage between 1 and 12 hours of the onset of cholera. The following results are recorded:—8 deaths to begin with out of 12 untreated cases, 5 deaths out of 19 receiving only bacteriophage, 7 deaths out of 37 cases receiving both bacteriophage and hypertonic salt solution, no deaths out of 2 cases receiving only hypertonic salt solution, and 5 deaths out of 9 cases which received no treatment after the bacteriophage was available.

Prophylactic effect of administration of bacteriophage to contacts was judged by the incidence of cholera among these contacts. In the first phase of the epidemic there were 42 per cent. of cases among contacts and in the second phase, when bacteriophage was being served out, only 13.3 per cent.

W. F. H.

SEIFFERT (Gustav). Bakteriophagen als Schutz- und Heilmittel bei Cholera. [**Bacteriophages Used Prophylactically and Therapeutically in Cholera.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 460-465.

The author gives a condensed account of the work which has been going on in British India during the past few years.

W. F. H.

MISCELLANEOUS.

AUSTRALIA, COMMONWEALTH OF: **Report of the Second International Pacific Health Conference held at Sydney, 3rd to 6th September, 1935.** 86 pp. With 1 map. Canberra: Govt. Printer.

The first International Pacific Health Conference held in Melbourne in 1926 was convened to consider public health matters of common interest to administrations in the Austral Pacific Zone. It was a first step towards securing closer international collaboration in the solution of public health problems and passed a number of detailed resolutions dealing with prompt diffusion of information regarding communicable diseases in the territories in the Zone, quarantine co-operation, and research into problems of common interest. The Austral Pacific Zone includes all territory and islands south of the equator and situated between longitudes 140°E. and 140°W.

The Second Conference passed no formal resolutions but the detailed report of its Proceedings is ample testimony to the value of such meetings and is of great interest to all in any way conversant with the special health problems of this fascinating part of the world. Dr. J. H. L. Cumpston, the Director General of the Commonwealth, once more presided over the Conference, and there were delegates from Fiji, Gilbert and Ellice Islands, Western Pacific, New Zealand Dominion and Dependencies, Western Samoa, Nauru, Papua, New Guinea, Norfolk Island, Queensland, Northern Territory, New South Wales, Federated Malay States, Netherlands East Indies, China and Japan.

In this note it is possible to do little more than enumerate the chief subjects discussed. Dr. McCallum provided a general disease picture of the Zone. Dr. de Rook confined his attention to health conditions in Netherlands New Guinea, about which very little information has been published. Malaria is the chief cause of sickness: *falciparum* infections preponderate but are of relatively mild type. Blackwater fever, however, is very common. The chief vectors are *A. punctulatus*, *A. punctulatus* var. *moluccensis* and *A. bancrofti*. Yaws is very prevalent, ankylostomiasis common and filariasis almost universal.

Leprosy was discussed at some length. Dr. Pearce supplied interesting information about the leper asylum on the Isle of Makogai, Fiji. Dr. Ryrie discussed the treatment of leprosy based on a large experience in Malaya: he made some interesting remarks about leprosy and race. The disease is relatively mild among South Indians, of average severity in Malays, and of great severity among Chinese. Information was forthcoming about leprosy in Northern and North-East Australia as well as in the Isle of Nauru.

Several delegates made interesting contributions to a discussion on diet in relation to climate, race, work, health and survival. Everywhere more emphasis is being laid on the importance of dietetic deficiency in relation to disease. Dr. Clements substantiated his claim that a diet deficient in protein, rich in cereals and partially deficient in vitamins A and B₂ plays a rôle of great importance in the causation of *ulcus tropicum* in New Guinea, the causal agents of which are spirochaetes and fusiform bacilli.

Yaws, filariasis, tuberculosis and leptospirosis were among the other diseases that came in for special consideration. With regard to the last mentioned Sir R. Cilento made some interesting observations about the fevers among workers in sugar cane in the north-eastern coastal

section of Queensland. Here, apparently, typhus and leptospirosis occur side by side, the syndrome being, Akiyami A (resembling *L. icterohaemorrhagiae*), Akiyami B (*L. hebdomadis*), endemic typhus (not mite-borne) and endemic typhus probably of the Japanese river fever type, mite-borne.

In the discussion of administrative questions relating to the work of Public Health administrations and Medical Services in the Zone the interest centred in the training of subordinate medical personnel. In this connexion the work of the Central Medical School in Suva, Fiji, and the training of Papuan Medical Assistants in the Sydney School of Tropical Medicine are noteworthy. *Norman White.*

ANIGSTEIN (Ludwik). Third Report on the Medical Survey of Liberia (Western and Central Provinces).—14 pp. 1936. Sept. Monrovia, Liberia: Govt. Printing Office.

The object of the survey was to examine the provinces named and to compare the conditions found with those of Sierra Leone and French Guinea. The journey was completed in two months. In the Western Province examination of 1,668 adults and children gave a yaws percentage of 24 and an estimated percentage of malaria of 60. From questions addressed to 304 women it was concluded that the "child mortality" exceeded 500 per mille. The Kissi tribe, whose economic standard was poor, had the lowest birth rate. Cases of human trypanosomiasis, leprosy and elephantiasis were seen.

In the Central Province the average spleen rate (1,309 children) was 50 per cent., and the incidence of yaws in 4,403 adults was 20 per cent. The child mortality here also was about 500 per mille (403 women). Human trypanosomiasis is probably present; eight suspicious cases were seen. An epidemic of smallpox was limited by the prompt measures taken, but it is stated that the Mano tribesmen, among whom it occurred, have a "sanitary law" by which the sick are isolated in a remote hut and the contacts are quarantined; old smallpox cases are entrusted with the nursing. It is singular that the Gbandi tribe of the Western Province have no fear of infection. In any case spread in Liberia is restricted by the fact that traffic is limited to bush paths; there are no roads or railways. In 3 per cent. of the males at the important centre of Sanoquellie there were symptoms of vesical schistosomiasis. In the hilly region of Nimba (6,000 ft.) the incidence of goitre in females was 8-10 per cent. BLACKLOCK's similar findings in Sierra Leone (see this *Bulletin*, 1925, Vol. 22, p. 652), are mentioned as well as those of the author at Macenta and Zerekore in southern French Guinea.

A leper settlement at Ganta (79 cases) is subsidized by the "International Leprosy Association"; "the living conditions of the lepers as well as the medical system applied require serious modification and improvement."

Three tables give the findings in each of 20 towns or villages; these will be useful records for future comparison. *A. G. Bagshawe.*

BULL (L. J. Forman). The Medical Service of Tonga.—*New Zealand Med. J.* 1936. Dec. Vol. 35. No. 190. pp. 396-400.

The kingdom of Tonga, "the last independent kingdom in the South Seas," consists of a group of islands 1,100 miles north of New Zealand,

and E.S.E. of Fiji, with a population of 31,000. The European medical staff comprises a Chief Medical Officer, two district M.O.s and a sister, and there are six Tongan doctors trained at the Medical School, Fiji. One of the Tongan doctors is described as almost the equal of a European M.O. and a most efficient surgeon; he is presumably to be excluded from the statement that all the Tongan members of the staff quickly deteriorate when they are left to themselves. Sanitation seems unsatisfactory for though there are boards of health their recommendations are seldom carried out. Drinking water is collected from inadequate catchment areas in cement tanks into which dirty buckets are dipped. Latrines are bore-hole and "an excellent breeding ground for cockroaches."

The main diseases are—tuberculosis of lung, glands and skin, the chief cause of death; typhoid of low mortality; filariasis and myositis. Yaws is very prevalent; the Tongans do not come for treatment till the secondary rash is well established and there is some natural immunity. Other diseases are, hookworm (not serious), conjunctivitis and trachoma, a mild form of tetanus, and some leprosy (12 cases in 3 years). Mosquitoes (species not named) are very troublesome.

The author, who is described as late C.M.O., holds out no inducement to anyone keen on his profession to take service under the Government of Tonga.

[Since Tonga lies east of the Fiji group one would expect to find, as apparently is so, no Anopheles and no malaria.] A. G. Bagshawe.

GALAMBOS (A.) & MITTELMANN (W.). *Albuminuria Solaris*.—*Jl. Lab. & Clin. Med.* 1936. Dec. Vol. 22. No. 3. pp. 246-248.

Albuminuria solaris is a term used by the authors to designate transient albuminuria, non-febrile, caused by [or associated with] skin reactions resulting from exposure to the rays of the sun. When there is severe reaction with chills, fever, malaise, and definite skin lesions, i.e. *dermatitis solaris*, the albuminuria is of a febrile type differing from the former in degree, for in that the fever is absent, the skin reaction mild and general symptoms hardly noticeable. The albuminuria persists so long as new areas of skin are involved, usually a few days only. It reaches its height in 24 hours or so, diminishes two to three days after the exposure and disappears in another day or two.

Four members in one family suffered in this way, the condition being discovered accidentally. A man, 50 years of age, used to report periodically twice a year for health examination. On a warm day in July he reported after a sunbath. All physical examination was negative except for a definite albuminuria. The following day his wife brought another specimen and as she herself was strikingly sunburnt, she also was asked for a specimen and this was albuminous. Two children, aged 17 and 14 years, had also sunbathed and showed similar reaction, and both had albuminuria. In each case the maximum occurred about 36 hours after exposure, then declined gradually till it disappeared 5-6 days after. The knowledge of this possibility is important for those engaged in insurance work when applicants present themselves for examination in the summer months and are apparently in excellent health, apart from albuminuria. The amount may be 1/4-1/2 per mille, more than "heavy traces." H H. S.

LEIMENA (J. M.) & SARDJITO (M.). Rhinoscleroma in de Minahassa. [*Rhinoscleroma in the Minahassa District of the N.E. Celebes.*]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Aug. 11. Vol. 76. No. 32. pp. 2010-2016. With 5 figs. on 1 plate.

Three cases of rhinoscleroma are here recorded from Celebes Island : they were diagnosed clinically, by isolation and identification of cultures of the rhinoscleroma bacillus and by fixation of complement tests. Fouadin injected intramuscularly was more effective in treatment than intravenous injection of tartar emetic. The ulceration and the bad odour disappeared while the infiltration became somewhat smaller.

W. F. Harvey.

SIEGENBEEK VAN HEUKELOM (A.). Pellagra in Batavia.—*Nederl. Tijdschr. v. Geneesk.* 1937. Jan. 23. Vol. 81. No. 4. pp. 278-286. With 6 figs. on 2 plates. [18 refs.] English summary.

"In recent years several cases of pellagra or pellagroid affections have been described in the Dutch Indies. Ten more cases are added in the present paper, observed at Batavia within 18 months. The diagnosis was based on the typical skin affection ; red tongue, diarrhoea and mental symptoms were absent only in a few cases. Anaemia repeatedly appeared to be absent. The colour index is often raised, and in a few cases macrocytosis was found. In 5 patients the gastric contents were examined, 4 of whom showed low or low-normal acid figures and one hyperchlorhydria. The figures for cholesterine, carotines and vitamines A and C in the blood were low.

"Four patients suffered from chronic colitis, mainly caused by amebiasis ; in the remaining cases no cause could be traced for the pellagra. Monotonous maize diet was out of question. Whether pellagra in the Dutch Indies is on the increase, and how a possible increase has to be explained, is a question which the author thinks at present unsolvable."

RUFFIN (Julian M.) & SMITH (David T.). A Clinical Evaluation of the Potency of Various Extracts of Liver in the Treatment of Pellagra.—*Southern Med. J.* 1937. Jan. Vol. 30. No. 1. pp. 4-14. With 6 charts. [19 refs.]

An attempt to evaluate liver preparations in the treatment of pellagra.

One hundred and seven patients in the Duke Hospital, Durham, South Carolina, were fed on a basic pellagra-producing diet such as was used by GOLDBERGER in his experiments on prisoners. Thirty of these cases promptly recovered before treatment had been commenced ; the remaining seventy-seven failed to improve. Of these 2 received vitamin B, (a preparation of rice polishings) intramuscularly without benefit : 5 were given lactofavin without improvement : of 5 to whom wheat germ was administered 3 slowly improved.

To 64 patients a liver preparation was given : 20 of 22 to whom an aqueous liver extract—Valentine—was administered orally, recovered : 2 of 9, who received intramuscular injections of an extract—Lilly—recovered : 1 of 3 injected intramuscularly with liver extract—Parke

Davis & Co.—recovered: only 3 of all 23 who received parenteral extract recovered.

To three a highly purified extract "266," for use in pernicious anaemia, was given; all improved but relapsed, as did some of the cases above mentioned not included among the recovered. The authors conclude that (1) a watery extract should be used, (2) it should be administered *per os*.

The watery residue of liver after extraction with alcohol given in large doses appeared to possess the curative factor. They believe that Goldberger's factor is composed of two or more factors.

H. S. Stannus.

SPIES (Tom Douglas), CHINN (Austin) & McLESTER (James B.).
Treatment of Endemic Pellagra.—*Southern Med. J.* 1937.
Jan. Vol. 30. No. 1. pp. 18-21.

The authors relate the results of treatment of endemic pellagra in the southern States by the method which Spies had found useful in alcoholic pellagra in the north.

A series of 73 cases in the Hillman Hospital, Birmingham, were thus treated and it is claimed that the mortality was reduced from 32 to 7 per cent. Of the 5 deaths which did occur, in none could the fatal issue be attributed to pellagra alone. The treatment consisted, as Spies has described before, in the most careful nursing with great attention to detail in each individual case. The diet should have a 4,000 to 5,000 caloric value and contain 150 grams of animal protein. Dry brewers' yeast in 30 gram doses thrice daily was administered in egg-nog as the specific remedy in all cases in which it was not contra-indicated by vomiting or in which the diarrhoea was not made worse and uncontrolled by bismuth and paregoric. In such cases liver extract intramuscularly was substituted. The response to treatment began in 24 hours and the average length of stay in hospital was only 12.7 days. There remains however one unknown quantity and that an important one—the relapse rate.

H. S. Stannus.

CHOPRA (R. N.), CHAUDHURI (R. N.) & DE (N.). Electro-cardiographic Changes in Epidemic Dropsy.—*Indian Med. Gaz.* 1937. Jan. Vol. 72. No. 1. pp. 1-3.

BOHEC. La fièvre estivale du Gulf-Stream. [**Summer Fever of the Gulf Stream.**].—*Ann. d'Hyg. Pub. Indust. et Sociale.* 1936. Sept. Vol. 14. No. 9. pp. 489-524. With 7 figs.

Under this name the author describes a short febrile disease occurring on transatlantic liners. The incidence and intensity are very variable from year to year, and from season to season, and coincide with certain conditions of place and climate. The disorder is commonest in the months of July and August when it may reach epidemic proportions. The symptoms in general resemble those produced in some of the short tropical fevers of uncertain origin. The onset is abrupt with a temperature ranging from about 99.5° to 101.5°F., and headache, colic, vomiting and bilious diarrhoea are usual symptoms. One very

interesting point in the aetiology is the high Summer incidence of attack on the return voyage from New York to Havre, as compared with the outward voyage from Havre to New York. Thus, to take three double voyages of the *Normandie* in 1935:—

	Voyage.	Cases.
Outward	(3rd–8th July)	1
Return	(10th–15th July)	121
Outward	(24th–29th July)	8
Return	(31st July–5th Aug.)	91
Outward	(14th–19th Aug.)	13
Return	(21st–26th Aug.)	34

The author points out, as an explanation of this difference in incidence, that the course of the outward voyage lies to the north of the Gulf Stream, whereas on the return voyage the vessel follows the course of the Gulf Stream as far as long. 40°, in order to gain the 2 knots an hour that the current adds to the engine speed. The sudden entry into the warm waters of the Gulf Stream after half a day's steaming from New York, the two days' voyage in water which in summer may reach a temperature of about 90°F., and the sudden exit from the Gulf Stream, with regional variations in the atmospheric humidity, pressure, and electrical state, together must throw a heavy strain on the metabolic functions and mechanism for heat control of the body. To the failure of the body to adapt itself to the rapidly changing external conditions, and the resulting derangement of function, the author attributes the symptom-complex which he calls the Summer Fever of the Gulf Stream.

W. P. MacArthur.

MACFIE (J. W. S.). "**Mossy**" Foot in Northern Ethiopia.—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 299–302. With 1 plate.

The author in January, when serving with the Ambulance Service in Ethiopia, saw at Waldia several cases of what has been described as lymphostatic verrucosis [see this *Bulletin*, 1936, Vol. 33, p. 475]. Thirty-one cases were seen in the first thousand patients coming for treatment. The condition had persisted for periods ranging between one and twenty years, the average being six, and the ages of the patients from 10 to 60 years. Both feet were usually involved, and the history obtained was that it started as a firm swelling on the dorsum, after which the skin at the bases of the toes became rough and papillomatous and the lesion spread till the dorsum and sides of the foot might be covered by a dense mass of warty growths. Sometimes fissures appeared and sepsis supervened, but not often. The oedema might extend some way up the leg and the skin become much thickened, to $\frac{1}{2}$ -inch at the bases of the toes. Pain was not marked, nor tenderness, the joints were not affected, sinuses did not form and the soles were in no instance attacked—distinguishing features from those of Madura foot. No history of injury was elicited [but in those accustomed to go barefoot, trauma after so long an interval would, if not severe, be forgotten]. Dr. Macfie was unfortunately working under conditions which made research impossible.

H. H. S.

NEGRONI (Pablo). Cincuenta casos de actinomicosis y resultados de la vacunoterapia. [**Results of Treatment of Fifty Cases of Actinomycosis by means of a Vaccine.**].—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Vol. 7. No. 4. pp. 662-695. With 29 figs. [30 refs.] English summary.

Notes are given of the fifty cases ; in 25 the lesion was on the neck and face and in another 6 on the face and temporal region, indicating a dental origin in 62 per cent. of the cases ; another 7 occurred in the lower limbs, 6 in the lungs and pleura, 4 in the abdomen, one on the wrist and one on the eye. The author regards club-formation as due to actinomyces, actinobacillus, and certain strains of staphylococci and of incidental importance only. From the lesions of the head, neck, lungs and abdomen he cultivated an anaerobic actinomyces, from those of the eye and limbs an aerobic growth—*Actinomyces asteroides* and *A. maduræ*. The former were referred to an autogenous infection from teeth, tonsils, respiratory or alimentary tract, the latter to exogenous lesions as injury by a thorn prick.

For treatment in 33 of the cases filtrates from cultures of the aerobic type in Sauton's medium were employed [the author calls the product a hetero-vaccine] and 20 recovered and have remained well for over five years, 6 improved considerably, 6 failed to respond ; results in the other four are not known. The number of injections given is mentioned in most cases, but not the size of the doses nor the length of intervals between doses.

H. H. S.

CRAWFORD-JONES (C.). Dermatomycosis in the Army.—*Jl. Roy. Army Med. Corps.* 1935. Nov. Vol. 65. No. 5. pp. 306-316.

DOBSON (D. C.). A Case of Myiasis.—*Jl. Roy. Nav. Med. Serv.* 1937. Jan. Vol. 23. No. 1. p. 74.

The patient on a cruise on the west coast of Africa presented a swelling between the scapulae and another just above the left external malleolus. In each there was found on incision a living larva of *Cordylobia anthropophaga*. [The report does not mention whether the man had been ashore and if so how long before. As a rule the eggs are laid on the ground and the emerging larva penetrates the skin setting up an inflamed swelling in a week.]

H. H. S.

CLEMENTS (F. W.). Tropical Ulcer, with Special Reference to its Aetiology.—*Med. Jl. Australia.* 1936. Nov. 7. 23rd Year. Vol. 2. No. 19. pp. 615-644. With 26 figs. (12 on 2 plates); 4 maps, 5 graphs & 1 chart. [133 refs.]

A study of tropical ulcer in a dependency of Australia and a comprehensive survey of the disease as it occurs elsewhere, with many tables. The author adds to knowledge of the dietary factor and has produced tropical ulcers in a large percentage of suitably fed and inoculated rats.

The economic importance of tropical ulcer is illustrated by a table of incidence in various countries. The Territory of New Guinea heads the list with a percentage of 35.8 (2,249 patients out of 6,277 admitted in the year) and is followed by Uganda with 13.7 per cent. (3,904 cases). [Elsewhere it is stated that few cases have been reported above 1,500 feet but most of Uganda is much above this level.] In New Guinea native labour on plantations may be reduced by 10 per cent.

Among the conditions which dispose to tropical ulcer the outstanding one is diet. Here an epidemiological survey yielded interesting results. The field work was done on the island of Manus, Territory of New Guinea, one of the Admiralty Group, some 100 by 45-60 miles, with 12,000 inhabitants. The western half is largely sago swamp. The inland people are agriculturists, the coast people fishermen. Of the agriculturists some grow taro, the rest make sago from the wild sago palm which is mixed with coconut before eating. The natives consume the food they grow or collect and whereas sago will keep for months taro must be eaten promptly. All natives obtain fish, by catching or by barter. The author compared the weight of food eaten by a number of taro and sago consumers respectively. Analysis of the diets showed that the food value of the ration of the taro eaters was, carbohydrate 718, protein 51, fat 17, total calories 3,239 and the equivalent figures for the sago eaters were 720, 39, 56, calories 3,530.

The natives calcine coral and the lime so produced mixed with betel nut and leaf or pod of the pepper tree is chewed by all. The author estimates that 4.8 gm. of lime would be taken in the day, corresponding to 3 gm. of calcium oxide. This is at least twice the amount required, so that any calcium deficiency in the diet of the Manus islanders is thus remedied.

The author estimated the vitamin B₂ content of taro by animal feeding experiments, which he describes; the conclusion is that when taro is the main article of diet it supplies an adequate amount of this complex. Animal feeding experiments with sago failed to reveal vitamins A, B₁, B₂, or C in measurable quantities. The chewing of pepper leaves provides sufficient vitamin C, but all sago eaters are inadequately supplied with vitamins B₁ and B₂; in these fish also is low.

The author goes on to give, with the aid of tables and maps, the geographical distribution of tropical ulcer on Manus in its relation to diet. These show that whereas the mean percentage incidence in villagers living on sago is 4.12, that of the taro-eating villagers is 1.14, a difference of 2.98, and these percentages are shown to be statistically significant. Thus the sago-eating villages as a class possess a high incidence rate when compared with the taro-eating villages, many of which enjoy a relative immunity. That the difference in the diets is responsible for the difference in the incidence of tropical ulcer is supported by the result of a drought, lasting 9 months. The taro crop failed and the taro eaters had to fall back on sago; the result was a 6-fold rise in incidence in the villages which had lost their taro crops, as is shown in table and chart. The same drought produced an epidemic of ulcers in New Hanover Island and here too the failure of taro had necessitated consumption of sago. The author postulates that "tropical ulcer is associated with a complete or, more probably, a partial deficiency of the vitamin B complex associated with a diet rich in carbohydrates and low in protein and fat, a combination of factors which brings about changes in the tissues, making them a suitable breeding ground for the causal micro-organisms."

A consideration of the nutrition studies of ORR and GILKS (1931) in East Africa [see this *Bulletin*, 1932, Vol. 29, p. 233] shows that their results were similar, except that these authors believed that the low calcium intake amongst the Wakikuyu was largely responsible for their tropical ulcers.

With reference to the influence of trauma, of 179 cases investigated in New Guinea 114 were of traumatic origin, and 60 began as a small swelling.

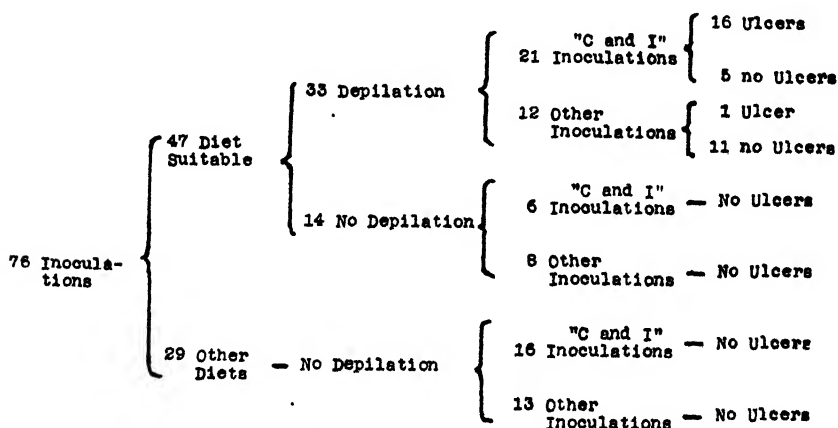
Other diseases have been regarded as contributing factors, e.g., malaria; the author reports, with figures, that there was no correlation between the incidence of ulcer and the splenic index in the children of 23 villages.

Bacteriology.—By the aid of dark ground illumination a study was made of the spirochaetes and fusiforms in tropical ulcers. Four of the spirochaete species described by David T. SMITH (1932) in the respiratory tract were found and two types of fusiform bacilli. A description is given of each. A day-to-day investigation was made of a series of 18 ulcers and the clinical stage and bacteriological findings are given in a chart. The main conclusions were that in active spreading ulcers or portions of ulcers spirochaetes and fusiform bacilli were present in large numbers, that in chronic clean ulcers there were none and that the spirochaetes were the active invaders of new tissue, the fusiforms fouling the surface.

KIRKPATRICK examined the mouths of over 2,000 Manus natives and found 25 per cent. to be suffering from suppurative periodontitis; smears from the gums showed abundant fuso-spirochaetal organisms. The incidence among the sago-eaters was greater than that among the taro-eaters (27 and 15 per cent.). The author suggests that the skin or clothes of his associates are fouled by the frequent expectoration of the betel-chewing natives and thus an insect bite or small abrasion may become infected. He notes that the natives commonly apply saliva to staunch a wound, after which they seal it with a wide flexible leaf, thus securing anaerobiasis.

He sought to confirm this hypothesis by producing tropical ulcer in an experimental animal.

STRONG (1926) produced lesions containing fuso-spirochaetes in monkeys but otherwise such attempts seem to have failed. Clements inoculated rats with material from cases of acute suppurative gingivitis. The animals received a diet similar in composition to the average diet of the sago-eating villagers. The composition of eight diets employed



"C and I" = Cautery and instillation.

[Adapted from graph in the *Medical Journal of Australia*.]

is tabulated. Several methods of inoculation were used. A large table gives the results. In 76 attempted inoculations 17 ulcers developed and an ulcer to be accepted had to be clinically typical and to contain living fusiforms and spirochaetes. Two factors were found to be essential for the development of ulcer: (1) appearance of depilation in skin of rat, (2) vigorous trauma prior to inoculation. Depilation only occurred in rats fed for some weeks on a diet low in protein and fat and deficient in vitamin B₂; vitamin A took no part; and all ulcers appeared in areas of depilation. Cautery and instillation was the most satisfactory method of inoculation, the cautery supplying the trauma. A hot needle was passed beneath the skin and the emulsion was run in along the line of the needle. The results are shown in Graph III [*supra*].

"The evidence points strongly to the assumption that as a result of a diet rich in carbohydrate and poor in protein and fat and deficient in vitamin B₂, certain changes occur in the tissues. Depilation takes place and the tissue resistance is so lowered as to enable spirochaetes and fusiform bacilli to flourish and a typical tropical ulcer to develop."

The author goes on to discuss the "reduction potential" of the skin of rats and its experimental investigation and he advances the suggestion that the anaerobic fusiform bacilli and spirochaetes are capable of developing in depilated skin because their reduction potential is greater than that of the skin.

The symptomatology of tropical ulcer as seen in New Guinea is described. The fuso-spirochaetal process is confined to the epithelium, subcutaneous tissue and fat; if muscle fibre and bone are involved pyogenic organisms are responsible. Of 184 ulcers 72 affected anterior surface of leg in lower half, 29 and 43 the medial and lateral malleolus, 18 the tendo Achillis and 22 other situations; the common sites are the areas supplied by the terminal vessels of adjoining arteries, which may explain the poorness of the blood supply. An estimation of serum calcium in ulcer cases did not give a figure below the normal.

The histopathology is described and attention is drawn to a resemblance between the histopathology of the skin surrounding a tropical ulcer and of the skin in the early desquamation stage of pellagra; in each there is proliferation of the epidermis.

Finally treatment and prevention are discussed. Various methods of treatment are tabulated. In New Guinea leg baths of heated sea water are employed. When the ulcer is clear and free from discharge it is strapped with adhesive plaster. Administration of yeast extract did not hasten healing.

A. G. Bagshawe.

ELLIS (M.). **The Relation of Blood-Calcium to Tropical Ulcer.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 383-388.

This article gives a clear account of a good piece of *ad hoc* research. A well-known work on medicine states that in many patients with tropical ulcer the blood-calcium is low; vegetable foodstuffs in Nigeria have been shown on analysis to be deficient in calcium; and, thirdly, good results had been obtained in cases of tropical ulcer by intravenous injection of calcium. The author set himself to verify these records by study of 50 cases of ulcer in different stages, the patients ranging in age between 6 and 50 years, and attending the Native Administration

Hospital at Bida, Niger Province. Taking the normal as 9-11 mgm. per 100 cc. thirty-one of the 50 had calcium within these limits, five were above and fourteen [not 13 as stated] below; the lowest was 7.5, the highest 14.0. In one table are presented the findings—the serum calcium, the size of ulcer, the time in healing—of twenty-three who remained under observation till the final healing [in this table there are two numbered 8, and two 23; 7 and 14 are absent]. Kramer Tisdall's technique was employed. In 28 per cent. of these cases only was the serum-calcium below normal. The author was not able to convince himself that the rate of healing bore any relation to the content of calcium in the serum and consequently he is of opinion that treatment by intravenous injection of calcium has no rational basis. [Some 16-17 years ago H. W. C. VINES showed that in cases of chronic ulcer—he was dealing chiefly with varicose ulcers—there was malregulation of calcium, the normal ratio of free (ionic) and combined Ca being disturbed, even though the total was within normal limits. He found that administration of parathyroid extract, with or without calcium according as the total was below normal or not, yielded good results in many cases. Similar change might be found in tropical ulcer.]

H. H. S.

THURMON (Francis M.) & CHAIMSON (Harry). **Gentian Violet Treatment of Leg Ulcers. Preliminary Report.**—*New England J. of Med.* 1937. Jan. 7. Vol. 216. No. 1. pp. 11-14.

This article is abstracted here in order that the method, very simple and easy to apply, may be given a trial in tropical countries in which chronic and intractable ulcers are prevalent.

The authors start with the well-known fact that a common feature of practically all chronic ulcers is secondary infection, and to combat this there is need of some substance which should have bactericidal properties, control excessive granulation, and not injure the tissue cells. They find a 2 per cent. solution of gentian violet in water has these properties, and they record their results in 15 cases of chronic ulceration of various types: hypertrophic, cornified, anaemic, varicose and oedematous. Except in the last, in which application is difficult because the exudate dilutes the stain and washes it away, the results were uniformly good. Pain and irritation subsided after three or four applications and disappeared in two to three days. When a firm, dry crust formed no reinfection took place and complete healing resulted in 2 to 7 months, though some of the patients had been receiving all the usual methods of treatment for a year or more. Another advantage is that the patients can be up and about during the treatment. The technique of application is as follows:

"A 2 per cent. aqueous solution of aqueous gentian violet* was used on all cases. A topical application of the solution was applied three to five times the first day, the patient being instructed to repeat this procedure through the following 2 or 3 days, or until a hard, firm, dry, adherent crust had formed. With each application the solution was permitted to air-dry and at no time were the ulcers bandaged.

"As long as the violet-stained crust remained firm, dry and adherent it was not disturbed. Should any portion of the crust become loose or pocketed, that portion of the crust was removed with sterile forceps and scissors, the ulceration cleansed with dry sterile gauze and gentian

* Aniline violet—Gentian violet B (Merck).

violet reapplied as previously directed or until a new dry crust had formed. Loosening of the crust or pocketing beneath it is usually due to a collection of thin grey purulent material beneath the crust."

H. H. S.

BERNSTEIN (C.), Jr. & GINSBERG (J. E.). **Sensitization to Milk as a Result of its Use in Nonspecific Foreign Protein Therapy.**—*Jl. Amer. Med. Assoc.* 1937. Jan. 16. Vol. 108. No. 3. pp. 193-194.

This record provides a warning for those using milk as a method of choice for treatment by protein shock.

The patient, a woman of 24 years, suffered severely from asthma which began two years earlier though she had had attacks of hay fever. Skin tests revealed positive reactions to certain pollens and to asparagus, banana, orange and potato, negative to milk, cheese, etc. Various forms of treatment having proved ineffectual, trial at desensitization by means of a defatted milk preparation was made, beginning with 0.02 cc. intradermally, increasing gradually every 3-4 days till after 4 months she received 0.7-0.8 cc. weekly. Improvement was observed until the sixteenth week, when local reactions appeared. After 19 weeks, 27 injections, a dose of 0.4 cc. produced severe asthma and unmistakable shock, necessitating the use of epinephrine. A month later the treatment was started again with 0.02 cc., but local redness 2 cm. in diameter followed. The authors state that it would be better in such cases to use a protein not related to any food product; typhoid vaccine or some biologically remote serum.

H. H. S.

BRAHIC (J.) & SARDOU (M.). Un cas de diarrhée chronique durant depuis 9 ans avec présence de trichomonas dans les selles; guérison rapide par l'essence de térébenthine (méthode d'Escomel).—*Marseille-Méd.* 1936. Mar. 15. Vol. 73. No. 8. pp. 333-338.

CLARK (Alfred). Report on the Effects of Certain Poisons contained in Food-Plants of West Africa upon the Health of the Native Races.—*Jl. Trop. Med. & Hyg.* 1936. Dec. 1 & 15. Vol. 39. Nos. 23 & 24. pp. 269-276; 285-295. [33 refs.]

KINGSBURY (A. N.). **The Interpretation of Wassermann and Kahn Results.**—*Bull. Inst. Med. Res. Federated Malay States.* 1936. No. 2. 4 pp. [Summary appears also in *Bulletin of Hygiene.*]

This author working in the Malay States employed the Harrison-Wyler technique for the Wassermann reaction and the Standard Kahn test. Both occasionally gave non-specific results. A positive reaction in yaws may be considered as specific. A positive reaction may be due to "coincident infection"; in the F.M.S. 35 per cent. of 100,000 tests during the past five years have been found positive, so that unless there is definite clinical evidence of either of these diseases the serum test should not unduly influence the diagnosis; moreover, the native will rarely submit to long continued treatment and when there are no physical signs the patient is probably not infectious, and therefore one or two injections are unlikely to be of much advantage. Causes of positivity other than syphilis are numerous, according to reports, leprosy, malaria and tropical typhus being the most important;

in many cases, no doubt, concomitant syphilis may have been the reason. In 15 cases of benign tertian and 37 of subtertian malaria there were 8 positive Wassermann reactions and 4 positive Kahn and 11 positive Wassermann reactions and 5 positive Kahn respectively. From film examinations it appeared that the serum reaction was more likely to be positive when the malarial infection was a very heavy one but fever *per se* had no influence; considerable variations were noted in the results of tests carried out on the same cases at relatively short intervals. In leprosy it was noted that positive reactions tended to occur in the advanced nodular type rather than in the nerve type. In typhus fever weakly positive reactions occurred during and immediately following the attack.

In general, the author found the Kahn reaction rather more sensitive and specific than the Wassermann. A frankly positive (++) Wassermann or Kahn reaction indicate syphilis or yaws except during defervescence of a severe malarial attack or in advanced cutaneous leprosy. Weakly positive (+ or \pm) results should be accepted with caution and repeated on a second specimen. The Wassermann and Kahn reactions are useful but should not dominate the field of diagnosis.

[A \pm Wassermann reaction should not be interpreted as "weakly positive"; neither Harrison nor Wyler would allow this.]

T. E. Osmond.

BENHAMOU (Ed.) & GILLE (R.). Les conditions de floculation et de gélification des sérums pathologiques. [**Flocculation and Gelification of Pathological Sera.**—*C. R. Soc. Biol.* 1935. Vol. 120. No. 32. pp. 428-429.

— & —. L'indice de floculabilité des sérums dans les réactions de floculation et de gélification. [**Flocculability Index of Sera in Flocculation and Gelification Tests.**—*Ibid.* pp. 430-432.

These two papers have to do with the various flocculation and gelification reactions which have been largely used as an aid to the diagnosis of leishmaniasis. With them are included also Henry's tests or flocculations produced by melanin or albuminate of iron in malarial sera. The authors find that one can arrive at a kind of index of flocculability given by the formula
$$\frac{\text{euglobulin}}{\text{albumin} + \text{cholesterin}}$$
 In normal sera the index has a value of 0.01 to 0.05. In malaria it may reach 0.1, 0.2 or even 0.3, while in kala azar it may vary from 0.15 to 0.8 or even 1.0. The positive reactions are given when the index is high so it must be evident that though positive reactions may be suggestive of certain conditions there cannot be anything absolutely specific about them. A possible reaction thus indicates only a certain state of the serum, whatever may be the cause of this condition. C. M. Wenyon.

MARCZEWSKI (Stanislas). Gélification du sérum humain par les bases. [**Gelification of Human Serum by Bases.**—*C. R. Acad. Sci.* 1936. Feb. 10. Vol. 202. No. 6. pp. 510-511.

The author states that he has confirmed the observations of KOPACZEWSKI on the gelification of sera and proteids by acids and now points out that numerous bases also have this power in the case of human sera, and that the concentration of OH-ions is not the sole determining factor.

C. M. W.

HICKS (E. P.) & DIWAN CHAND. **A Mosquito Survey of Karachi Air Port.**—*Records of the Malaria Survey of India*. 1936. Dec. Vol. 6. No. 4. pp. 515–535. With 1 map.

This survey was made to determine the presence of *Aedes aegypti* and Anophelines in Karachi air-port; the prevalence of the former is of obvious importance in the face of rapid development of civil air transport. *Aedes aegypti* does not breed naturally in the air-port; it breeds freely in Karachi harbour, however, and it might well become established if water be allowed to stand. There is a piped water supply. Vigilance will be required when the population of the air-port increases. *A. stephensi* was the most prevalent anopheline: its control will be assured if measures, similar to those recommended in this paper, be adopted.

Norman White.

BRITISH MUSEUM (NATURAL HISTORY). Economic Ser. No. 3. **Fleas as a Menace to Man and Domestic Animals: their Life-History, Habits and Control** by James WATERSTON, B.D., B.Sc. Third Edition. Revised by P. A. Buxton, M.A. 20 pp. With 1 plate & 6 figs. 1936. London: Trustees of the British Museum. [4d.]

The pamphlet was published originally in 1916, and reprinted in 1920. Certain parts of it have now been revised, but substantially it remains unaltered. It is written for those who have some knowledge of insects, and are prepared to give their serious attention to it, and it can hardly be described as a popular pamphlet. The principal topics dealt with are the external and internal anatomy: the biology of all stages, including a new short section on the effect of climate upon the numbers of fleas: certain fleas commonly found in the British Isles: the relation of fleas to plague and (very shortly) to murine typhus. A section on control brings the work to an end. Judging from the many remedies proposed, it will be concluded that we have still much to learn.

P. A. Buxton.

MACKERRAS (I. M.), FULLER (Mary E.), AUSTIN (K. M.) & LEFROY (E. H. B.). **Sheep Blowfly Investigations. The Effect of Trapping on the Incidence of Strike in Sheep.**—Reprinted from *Jl. Council for Scient. & Indust. Res.* Australia. 1936. Aug. Vol. 9. No. 3. pp. 153–162. With 2 figs.

The relation of this paper to medical entomology is that it supplies some quantitative information on a perplexing and important question. If one wishes to control some insect which has a very high potential rate of multiplication (*e.g.*, the green-bottle and the house-fly), is it or is it not worth while to kill adults?

The authors selected several paddocks, apparently similar to one another, and ran large numbers of sheep on them, trapping the blowflies in some paddocks, but not others. In several experiments it was observed that the sheep were less infested in the trapped than in the untrapped paddocks, and the difference was so great that it could not reasonably be attributed to chance. We may take it then that under the particular conditions existing in Australia, trapping adults did

reduce the wild population of flies, a point of considerable importance. Whether this can be done under other conditions, and if so, at what cost, remains to be found out.

P. A. B.

OOSTHUIZEN (M. J.) & SMIT (B.). **Electrocuting Insects.**—*Farming in South Africa*. Pretoria. 1936. Mar. Reprint No. 27. 3 pp. With 3 figs. [Summarized in *Rev. Applied Entom.* Ser. B. 1936. Sept. Vol. 24. Pt. 9. pp. 214–215.]

“Electrically charged screens for killing insects, such as have been used in the United States for several years are now being sold in South Africa, and in this paper the authors describe experiments carried out to test their efficacy. The regular service supply of 220 volts was converted by means of a transformer to one of about 4,000 volts with current of approximately 18 milliampères, so that insects would be killed on contact but the device would be harmless to man or animals. The types available are a flat screen to fit over a window in places where flies are abundant or over a flat metal box in which dishes of bait such as milk or meat are placed, or a circular screen round a strong electric light to which flies are attracted. Complete screen doors fitted with electric screens are also available from the factory. Guards to prevent man or animals from coming into contact with the screens, and troughs or trays to collect the dead flies may also be obtained.

“At an abattoir at Potchefstroom a screen 18 by 24 inches was fitted in a window through which many flies passed. It was operated for 260 hours of daylight during November and December and destroyed 131,375 examples of *Musca domestica*, L., 3,375 of *Chrysomya chloropyga*, Wied., 1,601 of *Lucilia sericata*, Mg., 719 of *C. albiceps*, Wied., 24 of *C. marginalis*, Wied., and 184 other insects that were not identified. The highest catch of house-flies between 6 a.m. and 4 p.m. was 3,430, whereas the highest catch in 24 hours was 6,983; it was noticed that many flies tried to gain entrance through the window just before sunset. The comparatively small number of blowflies electrocuted may have been due to the exceptionally dry weather, which decreased their abundance. It is believed that the numbers of insects counted do not accurately represent those killed, and that from 25 to 50 per cent. of those destroyed were lost, being completely burned up, blown out of the collecting trays, or eaten by birds, which visited the trays almost daily. The amount of current consumed was low, the screen being operated for about a month on 2–3 units. The screen should be especially useful in dairies, abattoirs and buildings on the sewage farms of towns and cities where flies are abundant. It may also be used in dwellings, when in addition to destroying house-flies it will prevent mosquitoes entering at night; moreover, it offers increased ventilation and light as compared with an ordinary screen. The unnecessary sparking and short-circuiting caused by insects lodging between the two electrically charged plates placed across the screen to strengthen it could be remedied by bending the plates outward away from each other.

“Two of the lamps surrounded by electrified screens were tested at night in Pretoria on the stoep of a residence. One was fitted with a mercury-vapour tube, which gave a subdued blue light, and the other with a 75-watt frosted bulb, which gave a bright light; both lights attracted insects, but the white light attracted more, probably because of its greater intensity. In both cases the screens were satisfactory.”

HEYMONS (R.) & VITZTHUM (H. Graf). Beiträge zur Systematik der Pentastomiden. [On the Pentastomidae.]—*Ztschr. f. Parasitenk.* 1935. Nov. 4. Vol. 8. No. 1. pp. 1-103. With 36 figs.

The authors give a review of the systematics of the Pentastomida, a group of animals parasitic in vertebrates. Many figures of sections and anatomy are included. Unfortunately the bibliography, which would have run to about 500 references, had to be excluded for reasons of space. Those interested in human parasitology will find much valuable information about *Armillifer armillatus* and *Linguatula serrata*, the two forms which not uncommonly occur in man. The paper gives not only a full list of their intermediate and definitive hosts and of their geographical distribution, but also some account of their biology.

P. A. B.

REVIEWS AND NOTICES.

HACKETT (L. W.) [M.D., Dr. Ph., Assistant Director, International Health Division, the Rockefeller Foundation]. **Malaria in Europe. An Ecological Study.** University of London Heath Clark Lectures, 1934 delivered at the London School of Hygiene & Tropical Medicine.—pp. xvi+336. With 60 figs. 1937. London: Humphrey Milford, Oxford Univ. Press. [10s. 6d.]

Material collected for the Heath Clark Lectures given in London in December 1934, brought up to date, is the foundation of this book. It is an admirable production. It contains a lucid, well-balanced discussion of the malaria problems of Europe, with special reference to the acquisition of knowledge, concerning the part played by the different races of *Anopheles maculipennis* in the spread of the disease, that has made the last decade noteworthy in the history of malaria research. To those who have had the good fortune of seeing something of the work that has been done by the author and by his colleagues in the investigation and control of malaria in countries of South Europe during the last ten years the book will make a special appeal. As an authoritative statement of the present state of our knowledge concerning the problems that still await solution and of the manner in which existing knowledge can be utilized to best advantage in the fight against malaria in Europe the book cannot fail to interest all concerned with this important branch of health endeavour.

There has been in the past a marked cleavage of opinion among malariologists regarding the vexed question of the control of malaria in Europe. There are many who have looked upon malaria in Europe as a social disease, its prevalence being in large part attributable to social and economic factors, the removal of which would be followed by the rapid disappearance of the disease. Others regard the prevalence of the disease as a local question, a parasitism adapting itself to all sorts of conditions, able to turn social factors to its use, but not dependent upon them, and eradicable only through the effective control of the insect vector. The latter is the doctrine to which the author subscribes wholeheartedly and numerous and convincing are the arguments which he marshals to justify his faith. Successful achievements, in varied conditions by a diversity of measures, are even more convincing than the arguments, and of such there is a rich record. In divided counsels the author sees a barrier to progress in the effective control of the disease and this, one feels, was perhaps the chief incentive to write this book. The caption to Chapter I is apposite, "If the trumpet give an uncertain sound, who shall prepare himself to the battle?" In the same line of thought is the following quotation from the last page of an interesting book. "The important fact is not that there are unsolved, and at present insoluble, problems of malaria in the world. It is that there are thousands of communities oppressed for ages by the disease that could be liberated with a little thought, energy and money which would not be difficult nowadays to assemble and apply. The mechanism of malaria transmission is so complicated and delicate that it never has been able to resist any long-continued sabotage. Persistence is more important than perfection, and whether control is a partial failure or a partial success depends on the point of view."

Norman White.

TROPICAL DISEASES BULLETIN.

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HELMINTHIASIS.

ABDEL SHAFI. **Historical Review of Egyptian Splenomegaly and Allied Conditions.**—*Jl. Egyptian Med. Assoc.* 1936. Oct. & Nov. Vol. 19. Nos. 10 & 11. pp. 561-591; 631-651.

——. **Critical Study of the Different Theories on the Aetiology of "Egyptian Splenomegaly."**—*Ibid.* Nov. Vol. 19. No. 11. pp. 652-672.

ABDEL SHAFY MOHAMED. **Egyptian Splenomegaly. Part III. Studies on Schistosome Toxins.**—*Ibid.* Dec. No. 12. pp. 737-748.

The name "Egyptian splenomegaly" ought to disappear for the disease is found wherever intestinal schistosomiasis is endemic and there is much more in it than enlarged spleen. The name bilharzial hepatolienal fibrosis given by SALAH should be used.

The 3 papers have this range: I. An historical review in the first and part of the second papers. II. A critical study of the different theories of its causation. III. Studies on schistosome toxins filling the third paper.

I. This valuable summary would have had added value had a list of references been given. II. The disease was first thought to be protozoal-leishmaniasis. FERGUSON and DAY drew attention to its likeness to, or its identity with, Banti's disease; on this basis RICHARDS started taking away the spleen with good results. As to mechanism, DAY put it down to congestion from fibrosis of the liver caused by ova of *S. mansoni*, while GUIRGIS held this to be caused by male worms, ONSY put it down to long continued deposits of eggs in the spleen, KHALIL to hepatic cirrhosis from chronic intestinal toxæmia, SERRA to the toxic action of cercariae through the spleen, AGATY to local action of ova in liver, spleen and marrow. III. As to toxins these are the author's conclusions.—

"As a result of naked-eye and histological examinations of a large series of bodies for bilharzial lesions, I can safely state that although the incidence of ova in the liver is a fairly high one, the other organs and tissues forming the *schistosoma mansoni* 'area' always show much greater deposits of ova, and infection of the liver alone is an unknown thing. The high incidence of ova in the liver in some cases may be partially due to their being deposited in large veins and washed down by the portal blood to the liver. So bilharzial infection of the liver in splenomegaly cases is only a trifling factor compared to the extent of the infection and, therefore, we must not ignore the more important and more constant deposits in the lower regions of the *schistosoma mansoni* area which largely

if not solely contribute to the production of endemic splenomegaly. To prove this contention, we only need to remember that in most cases of Egyptian splenomegaly the number of ova found in the liver is very small in comparison to the extensive cirrhotic changes occurring in that organ."

Clayton Lane.

ABDEL MAGID (I.). **Egyptian Splenomegaly in Edfina.**—*Jl. Egyptian Med. Assoc.* 1936. Nov. Vol. 19. No. 11. pp. 689-693.

"Pathological reports on 200 removed spleens showed that about 95 per cent. were bilharzial spleens, 2 per cent. were malarial and 3 per cent. showed mixed bilharzial and malarial infection. . . .

"In early stages of the disease the malpighian bodies show hyperactivity. There is dilatation and congestion of the venous sinuses and possibly interstitial and subcapsular haemorrhages. The reticulo-endothelial tissue shows hyperplasia. There is increase of fibrous tissue causing thickening of the capsule and trabeculae and also diffusely distributed in the entire pulp. There is considerable eosinophilic infiltration, may be giant cell formation and very rarely bilharzia ova. Intra-cellular granules and blood pigment due to increased phagocytic action are seen. In a few cases with coincident old malarial infection, there is also malarial pigment inside the cells. Later on, as the disease advances, there is gradual atrophy of the malpighian bodies, there may be atrophy in some places and activity in others and the reticulo-endothelial tissue becomes transformed into fibrous tissue. In very advanced cases the normal picture of the spleen disappears, the malpighian bodies are atrophied, the spleen pulp is scarce and almost entirely transformed into fibrous tissue and there may be calcareous deposits in the trabeculae. The weights of the spleens removed varied from 2.5 to 5.5 kg.

"The liver shows bilharzial periportal and diffuse cirrhosis with bilharzia ova, cellular infiltration and giant cells. There may be granular or fatty degeneration of liver cells and of necrotic foci. There may be adhesions due to attacks of peri-hepatitis.

"The Blood Picture is that of secondary anaemia and leucopenia with relative diminution in polymorphs and increase in eosinophyles and large hyaline cells."

C. L.

GONZALEZ BOSCH (Rodolfo) & MOSTO (Domingo). Hidatidosis cardíaca.

Hidatidosis cardíaca en un paciente con cuadro clínico-electrocardiográfico de infarto de miocardio. [**Hydatid Cysts of the Heart.**—*Prensa Méd. Argentina.* 1937. Feb. 10. Vol. 24. No. 6. pp. 308-318. With 12 figs.

The patient was a man of 48 years with an eventful history. He was a Russian and at the age of 12 years suffered from polyarticular rheumatism and afterwards frequently had attacks of joint pain. He fought in the Great War and when the revolution broke out in Russia, being "contra-red" he escaped to Turkey where he stayed for eight years, and suffered from typhoid fever, typhus and bacillary dysentery and for some years was in poor health. He went to South America as one of a group of Cossacks giving exhibitions in horsemanship, and for the last five years worked as a carpenter. During these five years he had had six attacks of intense precordial pain and on his entry into hospital on 29th February, 1936, he had signs of myocardial infarct confirmed by electrocardiograph. W.R. and Kahn reactions negative. Hydatid was [for reasons not given] suspected and this

diagnosis was confirmed by marked intradermal reaction, eosinophilia (no ova in stools), pulmonary shadows, and their presence in the heart was suspected because of the "heart attack" eleven months before, irregularity of cardiac outline, absence of valvular lesions. He died two months after admission with signs of cerebral embolism. Limited post-mortem examination only was permitted, *viz.* of the thoracic viscera, and the findings were: Two hydatid cysts of the right lung, one in the left; several small cysts at the hilum on both sides; hydatid of pericardium, many in the right and left auricles and left ventricle. As the cranial cavity was not allowed to be opened, the cerebral embolism could not be proved. Illustrations are given of the electrocardiographs, the heart, the lungs and the microscopic anatomy of the heart and the cysts.

H. H. S.

STERLING (Robert) & GUAY (A. J. L.). **Invasion of the Female Generative Tract by *Ascaris lumbricoides*.**—*Jl. Amer. Med. Assoc.* 1936. Dec. 19. Vol. 107. No. 25. pp. 2046-2047.

The details of the invasion are these. A woman of 21 had lower abdominal pain and tenderness, and thickening and tenderness on both sides of the cervix. "Examination of the stool revealed *Ascaris lumbricoides* 4 plus, *Necator americanus* 3 plus, *Trichuris trichiura* 3 plus." On operation by a midline abdominal incision "Encysted in the right tube were five full grown and viable roundworms . . . one ascaris was found encysted in the cul de sac, surrounded by purulent exudate." There was no fistula. A drain was left in the cul de sac. The later events were: day 1, ascaris came through the incision; day 2, ascaris came through the incision, faecal drainage, hexylresorcinol; day 7, hexylresorcinol; day 12, ascaris through the incision; day 14, faecal drainage stopped, temperature 105° F., subtertian malaria parasites; day 16, temperature became normal. After operation no ascaris eggs were seen in stool or discharge, no mention is made of the other worm eggs in the stool.

C. L.

HEADLEE (William Hugh). **The Epidemiology of Human Ascariasis in the Metropolitan Area of New Orleans, Louisiana.**—*Amer. Jl. Hyg.* 1936. Nov. Vol. 24. No. 3. pp. 479-521. With 2 figs. [40 refs.]

Headlee examined the stools of 10,990 individuals by smear and by centrifuging after filtering through cheese cloth, and soil samples from about 74 special premises on which 79 families lived, the family being the unit of study. In the main, stools came from those who were attending out-patient departments, that is from the poorer classes. The percentages of infections seen were *E. histolytica* 8.1, *A. lumbricoides* 6.6, *N. americanus* 3.4, *T. trichiura* 8.5, *S. stercoralis* 2.5, *E. vermicularis* 1.6, *Taenia* species 0.2, *H. nana* 0.2. As to age, the incidence of ascaris was highest in those below 6, of trichuris in nearly adult life. 160 were members of ascaris families. There were 74 "special environments" where special investigations, including soil sampling of the backyards, were made. Of the 405 soil samples taken from all premises 53.1 per cent. had ascaris eggs in them and 28.4 those of trichuris, while there were also seen others identified as *E. vermicularis*, *Toxocara canis*, *T. cati*, *Ancylostoma caninum*, *Dipylidium caninum* and *H. diminuta*. About half the [ascaris] eggs held "motile infected larvae," nearly a fifth of the eggs were degenerate. Of the soil samples taken

from the surroundings of 13 premises in which negroes lived 80.9 per cent. had ascaris eggs in them, and while these places made up 17.6 per cent. of all examined, they included 36.6 per cent. of all ascaris eggs. In the places specially reported on, latrines were of 3 kinds; "sanitary toilets" inside the house connected with sewers in 42, toilets "of the sanitary type (having a sewer connection)" outside the house in 16, and "privy" types with no sewer connexion in 16. "The environments with privies had a larger percentage of positive foci than either of the other classes, and a greater percentage of positive environments was found among those with outside toilets than among those with inside toilets." As to defaecation in the backyard, this is believed to be exceptional and to be mainly the act of young children. Four cases of earth eating were discovered in persons with heavy infections. This example is given; 8 soil samples were taken in one backyard, No. 1 close to the outside toilet had in it 425 ascaris eggs in moist, packed and shaded earth, "it was at this spot that the children were supposed to have defaecated most frequently, but there were no visible signs of stools"; No. 2, the width of the yard away in loose humus, cinders and ashes, shaded all day, 24 ascaris eggs; No. 3 a little nearer to the toilet than No. 2 but with piled up cinders, 6; Nos. 4 and 5 close to the sewer vent which overflowed at times, 0 and 0; No. 6 and 8 from the main gutter 21 and 15, No. 7 from under the house where there was evidence that the children played 0. Under prevention, "the population group must be made conscious of the dangers of soil pollution, and *conscious of the dangers of coming in contact with infested soil*," and the same applies to the medical man for "he very rarely has knowledge concerning the life history of this parasite and the factors which influence its propagation and dissemination."

[The sentence with italics (they are in the original) is the essence of the author's view on prevention. By intention or oversight there is no mention of the evidence for carriage of ascaris eggs by wind (this *Bulletin*, 1934, Vol. 31, p. 605) and yet this paper by Headlee seems to me to strengthen that suggestion. As the spot map shows the ascaris infections in New Orleans are not evenly spread but are massed into clusters, and the figures on the map show that all but 2 of the non-sewered privies are in one or other of these clusters; it at least suggests that the privy is the centre for the spread of an air-borne (that is fly-borne or wind-borne) infection. In view of the evidence for air currents in the carriage of threadworm infection (LENTZE, this *Bulletin*, 1936, Vol. 33, p. 121) the continuous, and at times deliberate, disregard of this possibility in ascaris infection is not in the interests of public health.]

C. L.

CLAPHAM (Phyllis A.). **Preliminary Observations on the Infectivity of *Ascaris lumbricoides* to Swine.**—*Jl. Helminthology*. 1936. Dec. Vol. 14. No. 4. pp. 229-232.

A hopeful method of causing pigs to become infected with *A. lumbricoides* from the pig is by giving a series of small doses.

The experiments had to be broken off because several members of the staff of the Institute of Agricultural Parasitology, London School of Hygiene and Tropical Medicine became sensitive.

"Resistance of the pig to *Ascaris* is of a doubtful nature so that immunological reactions are not likely to affect the method. If there is a resistance it is slight and of a temporary value for as has been shown, it is possible

to effect infestations in adult pigs. Second infections also may be induced very shortly after the first has been lost or even while it is still resident in the body of the animal. That there is something of the nature of a self-cure, however, is indicated again by Morgan's experiments in which the worm burden was completely lost although there was every opportunity for re-infection. This suggests that there may be some degree of acquired immunity."

C. L.

AFRICA (Candido M.) & GARCIA (Eusebio Y.). **Embryonated Eggs of *Ascaris lumbricoides* in the Mesenteric Tissue of Man, with Special Reference to the Possibility of Autoinfestation.**—*Jl. Philippine Islands Med. Assoc.* 1936. Aug. Vol. 16. No. 8. pp. 461–467. With 2 plates.

Embryonated and other ascaris eggs were present in the mesenteric tissue of a woman who died of peritonitis after rupture of her small intestine which had about 1,000 ascaris in it.

The rupture was a transverse slit, 4 cm. long, a foot above the ileocaecal valve. In the abdomen were many dead ascaris in a thick yellowish fibrinopurulent exudate. "To the pathologist the rupture appeared to have taken place about 20 hours before death." In a piece of mesentery taken out at autopsy were pearl-like nodules about 2 mm. across. Under the microscope they were made up of a well limited mass of dividing fibroblasts, endothelial and round cells, a few polynuclears, no eosinophils, with at the centre ascaris eggs in development, or in most cases embryonated and apparently healthy with viable larvae, while some were empty. Round the ascaris eggs was a cordon of giant cells. "Indeed, beautifully formed giant cells were seen tugging at the contents of eviscerated eggs or fragments of them trying to engulf the foreign objects." That the eggs got there after their entry into the blood stream from the intestine and their deposit in spots in the mesentery is held unlikely. The number of eggs (there were as many as 80 in one section), the great tissue reaction, and the presence of many embryonated eggs (which need 9 to 15 days after oviposition to reach that stage) led to the suggestion that one or more ascaris had got into the peritoneum before the rupture which caused the woman's death. The possibility of autoinfection as a normal part of the life history comes under consideration.

C. L.

SINDONI (Manlio). *Ascariasis ed emorragia gastrica mortale. [Ascariasis and Fatal Haematemesis.]*—*Riforma Med.* 1937. Jan. 16. Vol. 53. No. 3. pp. 86, 89–90. [29 refs.]

* The author performed an autopsy on a woman of 41 years dying after a copious haematemesis. The stomach presented near the cardia, on the posterior wall, an irregular lesion about 1 cm. in diameter with necrotic margin and in the viscus and the intestine numerous ascarides. No other lesion was found and the author concludes that the worms were responsible for the fatal haemorrhage.

H. H. S.

SCHÖNFELD (W.). *Ascaris*extrakte und Haut. [**Skin-Sensitivity to *Ascaris* Extract.**—*Arch. f. Dermat. u. Syph.* 1937. Jan. 2. Vol. 175. No. 1. pp. 54–70. With 5 figs. [51 refs.]

A study, essentially, of sensitiveness to ascaris.

There is widespread sensitiveness of the skin to extract of ascaris worms taken from man or pig; this applies to immediate as well as

delayed reactions. A skin hitherto insensitive becomes sensitized by repeated injections of ascaris extract. In certain circumstances there come into being anaphylactic shock with body-wide urticaria or asthma, and with, during its first hours, a fall in the eosinophils in the peripheral blood. But the skin-reaction from injections with ascaris extract is not specific; it is seen in infections with ascaris, enterobius and trichuris, and may be absent when there are worms and present when there is none. In children an immediate reaction is always present.

C. L.

CAMPBELL (Dan H.). **An Antigenic Polysaccharide Fraction of *Ascaris lumbricoides* (from Hog).**—*Jl. Infect. Dis.* 1936. Nov.–Dec. Vol. 59. No. 3. pp. 266–280. [17 refs.]

A polysaccharid from *Ascaris lumbricoides* of the pig is shown by precipitin, skin and anaphylactic tests to bring into being specific antibodies and to react with them in giving specific test reactions.

Its general characters are given: it is not affected by boiling or by proteolytic enzymes, cross reactions between it and protein fractions of the worm may well be caused by polysaccharid in the protein. Animal parasites may then be used to give a large amount of polysaccharid for immunological study.

C. L.

WOLFE (E. D. B.). **Some Notes on a Hookworm and Roundworm Survey.**—*Malayan Med. Jl.* 1936. Dec. Vol. 11. No. 4. pp. 224–225.

The survey was by a smear examination made on one occasion only and the material from school children was collected in labelled cigarette tins; 415 of 460 children in five schools in Pahang East were examined.

The first school was situated on a tidal river bank; with bucket conservancy; the number examined was 154; the percentage infected with ascaris was 77·3 and with hookworms 30·5. The second school was in a rice-growing area with shallow pit latrines and very high ground water, and the corresponding figures were 28, 89·3 and 14·3; the third a fishing village with bad pit latrines, the figures 91, 84·6 and 62·6; the fourth a floating river "jamban," 51, 94·1, 19·6; the fifth a small inland town, with bucket conservancy, 91, 56, 19·8. The detected percentage of infection with ascaris was then between 56 and 94·1 and with hookworms from 14·3 to 62·6.

C. L.

OSBURN (H. S.). **Hookworm in Natal Natives.**—*South African Med. Jl.* 1936. Oct. 24. Vol. 10. No. 20. pp. 710–712. With 1 map.

Of 199 stools of native male adults examined by a Willis floatation technique 30, or 15 per cent., had hookworm eggs in them, 5 of them had a history of sores on the feet. It is believed that the infection has no ill effects on these persons unless there is some other severe disease, but, if there is, the anaemia is greater than if there had been no hookworm infection.

C. L.

BACIGALUPO (Juan) & PASQUALINI (Rodolfo Q.). Nuevo foco de anquilostomiasis en la provincia de Buenos Aires. [**A Fresh Focus of Ankylostomiasis in the Province of Buenos Aires.**]—*Semana Méd.* 1937. Jan. 21. Vol. 44. No. 3. pp. 198–201. With 3 figs.

The authors examined a soldier, 20 years of age, in the Central Military Hospital and found that he was harbouring *A. duodenale*. He came from Martinez, a few kilometres north of Buenos Aires. Examination of other members of his family, none of whom had ever been out of Buenos Aires, showed that the father aged 55 years and four brothers whose ages ranged between 23 and 12 years were all infected, the faeces containing 1,000 to 2,300 eggs per gram, by Stoll's method.
H. H. S.

UPTON (R. G.). **Incidence and Severity of Hookworm Infestation in East Texas.**—*Amer. Jl. Public Health.* 1936. Sept. Vol. 26. No. 9. pp. 924–926. [11 refs.]

Examinations of 1,883 school children show widespread infection with hookworms and 1·5 to 2 per cent. of infections with *Hymenolepis nana*. In 237, the Caldwell's method of diagnostic examination was used, as to the others there is no statement.
C. L.

LEATHERS (W. S.), KELLER (A. E.) & WYMAN (B. F.). **A State-Wide Investigation of Hookworm in South Carolina.**—*Amer. Jl. Hyg.* 1936. May. Vol. 23. No. 3. pp. 600–614. With 3 maps & 1 graph.

With reference to the reviewer's remarks on the above-named paper [this *Bulletin*, 1937, Vol. 34, p. 25] Dr. W. S. Leathers writes confirming the calculation made in these remarks, namely that the figure for the incidence of hookworm infection in Saluda County, S. Carolina, appearing in the paper as 41·2 should be 4·12 per cent., an error due to an undetected and regretted misplacement of the decimal point.
C. L.

PALAZZO (Marco Quinto). Il primo caso di anchilostomiasi riscontrato in Cirenaica. [**The First Case of Ankylostomiasis met with in Cirenaica.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Oct. Vol. 17. No. 10. pp. 628–633. With 4 figs. (2 maps).

The patient was a girl of 12 years, anaemic, weak, with a history of geophagy; red cells 2,320,000, white 8,200 per cmm., Hb 32 per cent., C.I. 0·7. Ova of *A. duodenale* were present in the faeces. The child had come to Cirenaica from Egypt. The author wishes to record the case, because, he states, hookworm infestation is new to Cirenaica and practitioners ought to be on the look-out for possible cases in order that imported cases may not unwittingly spread infection.

H. H. S.

NISHI (Masanori). **A Biological Investigation on the Family Ancylostomidae. With Special Reference on the Results of an Experimental Investigation into the Rate of Infection, Immunity and the Site of Parasitism within the Lumen of the Alimentary Tract.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Dec. Vol. 35. No. 12 (381). [In Japanese pp. 2744–2760. With 3 charts. [51 refs.] English summary pp. 2760–2761.]

The paper deals with *Ancylostoma caninum* in the dog. Most parasites lie about the middle of the small intestine's length though the large intestine may contain them even when the small has none. Youth and smallness of the dog, and a first infection, are the conditions in which larvae reach adult life in the largest numbers. C. L.

BACIGALUPO (Juan) & LORETTI (Guido). La eritrosedimentación en la ancylostomiasis provocada por *Ancylostoma duodenale*. [**Corpuscle Sedimentation Rate in Ancylostomiasis.**]—*Semana Méd.* 1937. Jan. 28. Vol. 44. No. 4. pp. 262–264.

The authors have carried out the corpuscle sedimentation test in cases of infestation by *A. duodenale*, some of them severe with haemoglobin reduction to 61 per cent. and eosinophiles 18.5 per cent. of total leucocytes, but determined no departure from the normal. Although, or perhaps because, the findings were negative, they are worth recording since a change in sedimentation rate has been reported in several tropical conditions. H. H. S.

MEYERS (F. M.). Anchylostomiasis en bloedarmoede. [**Ankylostomiasis and Anaemia.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Nov. 24. Vol. 76. No. 47. pp. 3046–3055. With 1 fig. [22 refs.]

A survey of the literature for Dutch readers leads to the conclusion that direct treatment of the anaemia is as important as unworming and hygienic prevention. C. L.

KRÖBER (F.). Ein Fall von schwerer Chenopodiumölvergiftung, der in Heilung ausging. [**A Severe, but Non-Fatal, Case of Poisoning by Oil of Chenopodium.**]—*Deut. Med. Woch.* 1936. Oct. 23. Vol. 62. No. 43. p. 1759.

Judging by what was left in the bottle the man helped himself to 10 or 12 cc. of oil of chenopodium.

He was "boy" to a hospital sister. Vomiting (the vomit smelling of the oil), semiconsciousness, an appearance as of drunkenness, muscular spasms, some fever, smell of chenopodium in the breath and, after a saline aperient, in the stools, pupils dilated, sight and hearing lessened, and the pressure of spinal fluid raised—such were the chief immediate symptoms. Six months later the left arm and leg were spastic, with increased tendon reflexes and wasted and weakened muscles. The special senses seemed undamaged, as were bladder and bowel. Other investigations showed normal states. C. L.

OHL. Praktische Erfahrungen mit dem neuartigen Wurmmittel Helmofix. [**Practical Experiences with Helmofix, a New Anthelmintic.**]—*Muench. Med. Woch.* 1936. Oct. 16. Vol. 83. No. 42. pp. 1719-1720.

Helmofix capsules are recommended for the simplicity of their administration and the certainty of their action against all kinds of worms.

The capsules contain paracymol, thymol, kamala and castor oil. Paracymol is a synthetic product which is claimed to be half as toxic but as effective as oil of chenopodium. [The doses of these poisonous constituents in a capsule are not given, and of course the toxicity of oil of chenopodium depends on the amount in any specimen of its variable constituent ascaridol.] Although the emphatic claim is for the destruction of all worms, among the 123 cases treated the worms mentioned are ascaris, enterobius and in 3 persons tapeworms of unstated kind.

C. L.

GUICHARD (F.). La rotenone. Essai thérapeutique-toxicité. [**Toxicity of Rotenone used as an Anthelmintic.**]—*Ann. de Méd. et de Pharm. Colon.* 1936. July-Aug.-Sept. Vol. 34. No. 3. pp. 751-754.

Rotenone ($C_{23}H_{22}O_6$) from the roots of creepers of the genus Derris is ineffective against man's hookworms and is rarely well supported even in a dose of 20 mgm.

C. L.

FAUST (Ernest Carroll). **The Use of Anthelmintics.**—*Jl. Amer. Med. Assoc.* 1937. Jan. 30. Vol. 108. No. 5. pp. 386-392.

Various anthelmintics are considered.

Beta naphthol.—"It is contraindicated in nephritis and in malaria . . . In view of its relatively low efficiency and high toxicity, its use as an anthelmintic may well be abandoned."

Thymol.—"It is less toxic but much less efficient than carbon tetrachloride and is both more toxic and less efficient than tetrachlorethylene for eradication of hookworms . . . Clayton LANE is the only distinguished present-day advocate of thymol as the drug of choice in hookworm infection."

Oil of chenopodium.—"U.S.P. . . 'contains not less than 60 per cent. and not more than 80 per cent. of an acetic-soluble fraction' (i.e., ascaridol) . . . The therapeutic dose for an adult is from 1.5 to 3 cc." [The minimum lethal dose is less than 3 cc. (HOWARD, this *Bulletin*, 1919, Vol. 14, p. 159).] It is "contraindicated in nephritis, organic heart disease, hepatic dysfunction or ulceration of the intestine. It should be administered only under the direct supervision of a physician."

Carbon tetrachloride. "It has been utilized in hundreds of thousands of human cases, with very efficient results and relatively few deaths due to its administration . . . The therapeutic adult dose is 3 cc. of the pure drug. [The minimum lethal dose is 1.5 cc.] . . . It has about 90 per cent. efficiency for eradication of hookworms but should not be administered alone when ascaris is present . . . [nor] in the presence of absorbable fats or when blood calcium is below normal." [A test which is certainly not used when the drug is given in herd or even in mass fashion.]

Tetrachlorethylene.—"It has a cure rate of about 90 per cent. for hookworms, especially *Necator americanus*. [MAPLESTONE and

MUKERJI using the most accurate test at present available, namely D.C.F., found a cure rate of 20·8 per cent. for hookworms (this *Bulletin*, 1930, Vol. 27, p. 419).] . . . No deaths have been reported after its use in more than 100,000 cases of hookworm infection."

Hexylresorcinol.—"According to LAMSON and WARD a therapeutic dose (1 gm. of the crystoid for adults and children over 10 years of age in hard gelatin capsules of 0·2 gm. capacity each) is . . . from 80 to 85 per cent. [efficient] for hookworms." [Again, MAPLESTONE and MUKERJI (this *Bulletin*, 1933, Vol. 30, p. 205) using D.C.F. for diagnosis and giving 1 gm. of the drug in hard gelatin capsules to patients in hospital under strict fasting had a cure rate for hookworms of 7·7 per cent. only.] Its efficiency for ascaris is put as 90 to 100 per cent., and for trichuris 40 to 45.

Ficin, being crude sap, has at present to be used at once but if "made available for the medical profession it may provide a relatively non-toxic specific anthelmintic for *Trichocephalus* and *Enterobius*."

There is noted the work largely by Faust himself on methyl violet for *Clonorchis sinensis* and *Strongyloides stercoralis*, the use of male fern for tapeworms, of potassium antimony tartrate for schistosomes, the myositis of trichinosis and dracontiasis, of emetine hydrochloride for schistosomes, the liver fluke and *Paragonimus* and ethyl chloride for creeping eruption. The different infections are then taken up from the point of view of the anthelmintic treatment of each.

"This is one of a series of articles written by eminent authorities for the purpose of extending information concerning the official medicines." [But for dangerous medicines as agents of medical treatment, should not the authoritative spokesman be a medical man?]

C. L.

LANE (Clayton). **What Drug best kills Hookworms?**—Reprinted from *Amer. Jl. Digestive Diseases & Nutrition*. 1936. Dec. Vol. 3. No. 10. pp. 770-772. [21 refs.]

"Since hookworms rarely kill directly there is no justification for putting efficiency of anthelmintics before their safety."

"For individual, community, or medical man investigating anthelmintics, complete deworming is the only stable aim. The deadliness of anthelmintics is urged against this aim. But, before reaching the dangerous stage, thymol and tetrachlorethylene, like alcohol, give warning which makes for safety. Though it was probably these timely symptoms which led to the disuse of thymol, they are now being used to recommend tetrachlorethylene. The evidence for the safety of thymol is more solid than for any other drugs, so the objection to deworming by it is poorly based; its efficiency depends upon participation, but the effect of the finest participation has never been measured. Tetrachlorethylene merits controlled tests on a proper scale. The cheapness of beta-naphthol is no balance to its risks. Oil of chenopodium must not be given without knowledge of its ascaridole content, seeing how near together are the optimum and minimum lethal doses; its production of deafness is not negligible. Carbon tetrachloride is liable to be either highly extolled or dropped when it kills; to look before giving it for the factors known to make for deadliness is constantly neglected; with oil of chenopodium it lies under grave suspicion of ruining health and causing death in South America with simulation of yellow fever. Hexylresorcinol 'also ran,' not having fulfilled the expectations of its introducers.

"There is urgent need for the carrying through by experienced medical men of controlled comparative tests on an adequate scale to determine

on the only stable basis—deworming—what anthelmintic is the safest and most effective in the expulsion of hookworm. Such stable knowledge is long overdue.”

C. L.

CHUNG (Huei-Lan). **Observations on the Filariform Larvae of *Strongyloides fülleborni* in Different Media as well as in Tissue Cultures.**—*Ztschr. f. Parasitenk.* 1936. Dec. 15. Vol. 9. No. 1. pp. 28-49. With 4 figs. [15 refs.]

Growth of the larvae of *Strongyloides fülleborni* in different culture media and tissues was nearly absent.

The media into which the larvae were implanted were plasma or serum of rabbit, dog, sheep, monkey, living bits of kidney, testis, lung and liver of rabbit, or of the tissue of the chick embryo in Tyrode solution or serum; extracts of these tissues; and tissue cultures of corneal epithelium, liver and lung in rabbit plasma or spleen extract. They lived for many days unless there were bacterial contamination which soon killed them. When they lived long there was an insignificant amount of growth (except in one larva which increased to 980 μ) and no development. In like manner sterile larvae of *Ascaris lumbricoides* lived for 2 days in such media without development.

C. L.

SANDGROUND (J. H.). **On the Potential Longevity of Various Helminths with a Record for a Species of *Trichostrongylus* in Man.**—*Jl. Parasitology.* 1936. Oct. Vol. 22. No. 5. pp. 464-470. [16 refs.]

An infection, probably of *Trichostrongylus*, possibly of *T. colubri-formis* still persisting after 8½ years.

After giving records which put the life spans of various helminths as being of various lengths for the same species Sandground tells of what is evidently a self-immolation with the ova still present 8½ years later. They are judged to be those of *T. colubri-formis*. [The report seems to be that of which there was an abstract in this *Bulletin*, 1930, Vol. 27, p. 468, but, as the reference given in the text is one of the ten which are not present in the list at the end, one is not sure.]

C. L.

GHARPURE (P. V.) & GHARPURE (V. V.). **The Rarity of the Male *Enterobius vermicularis*.**—*Indian Med. Gaz.* 1937. Jan. Vol. 72. No. 1. p. 23.

The male *E. vermicularis* is not rare in the appendix.

The appendix, tied at the base and cut off at operation or after death was opened and as many as 12 males have been found in one. “They are very tiny, transparent, and often embedded in faeces” and their character is probably responsible for their supposed rarity. “We have not investigated in the same manner stools or intestinal contents from post mortems.”

[As to stools, male enterobius were found in great numbers for the reviewer in Bengal by one sweeper prisoner, and by one only, in the stools of his fellows after anthelmintics given for hookworms. The price, to be his on his release was, I think, an anna (say a penny) a hundred, and I got many hundreds. In this infection they must be common and as commonly missed.]

C. L.

HEYDON (G. A. M.). **Oxyuriasis : a Possible Main Source of Infestation.** [Correspondence.]—*Med. Jl. Australia*. 1936. Dec. 26. 23rd Year. Vol. 2. No. 26. p. 899.

Heydon holds that, in addition to the propagation of these worms by the creeping of the females out of the anus and the ingestion of the eggs, these are laid within the body and become adult without leaving the body. [LENTZE, in proving air carriage of these eggs, held that for their development they had to be 6 hours in an acid medium and that they could not get this without leaving the anus and coming to the stomach by the oesophagus, this *Bulletin*, 1936, Vol. 33, p. 121.]

C. L.

MCAUGHT (James B.) & ANDERSON (Eugene V.). **The Incidence of Trichinosis in San Francisco.**—*Jl. Amer. Med. Assoc.* 1936. Oct. 31. Vol. 107. No. 18. pp. 1446-1448. With 3 figs.

"1. Digestion of 200 human diaphragms obtained at autopsy in San Francisco from individuals ranging from 2 to 87 years of age revealed forty-eight (24 per cent.) infected with *Trichinella spiralis*.

"2. Examination of diaphragms from twenty-five new-born infants gave negative results.

"3. Living larvae were found in all the positive cases.

"4. The number of larvae was usually small, being less than twenty to each 50 gm. of muscle in 79 per cent. of the cases.

"5. None of the clinical records of the positive cases revealed a definite history of trichinosis.

"6. The highest eosinophil count recorded was 4 per cent.

"7. The heart muscle from fifteen patients with trichinous diaphragms was negative.

"8. Microscopic examination of stained slides for *Trichinella* is inadequate.

"9. Since there are no practical methods of inspection for trichinous meat, the consumer must assume the responsibility of preventing trichinosis by thoroughly cooking all fresh pork." C. L.

BACHMAN (George W.) & GONZÁLEZ (José Oliver). **Immunization in Rats against *Trichinella spiralis*.**—*Proc. Soc. Experim. Biol. & Med.* 1936. Nov. Vol. 35. No. 2. pp. 215-217.

"Our observations record that the only protection given to rats for a limited period of time against infestations of *Trichinella spiralis* was the feeding of small and gradually increased doses of trichinous meat. Attempts to protect rats by feeding anti- and convalescent serums, trichina powder, and by injecting intraperitoneally Coca's suspension of the dried and finely ground larvae failed to give any protection."

SPINK (W. W.). ***Trichinella* Antigen : Further Observations on its Use in the Diagnosis of Trichinosis.**—*New England Jl. of Med.* 1937. Jan. 7. Vol. 216. No. 1. pp. 5-8. With 2 charts. [20 refs.]

The antigen is made thus:—Thirty days after guineapigs have been fed on trichinosed meat, their muscles are finely chopped, digested in 0.4 per cent. pepsin and 0.3 per cent. hydrochloric acid in water, and incubated at 38°C. for 15 hours with frequent stirring. The solution

is put through wire meshes of 16 and 40 to the inch, left to stand, repeatedly washed by adding tap water and syphoning, dried, put in ether for 24 hours, then for 24 hours in a vacuum, over sulphuric acid, powdered, extracted for 3 days in Coca's solution (NaCl 0·7, NaHCO₃ 0·05, carbolic acid 0·4, distilled water to 100), passed through a No. 3 Seitz filter, and kept in rubber covered vessels.

For the test, 1·0 cc. of a 1 : 10,000 dilution of the antigen in Coca's solution is injected intradermally into the flexor surface of the forearm.

"On the basis of 4 years' experience, it is recommended that these tests be utilized routinely as aids in the diagnosis of doubtful cases of trichinosis.

"During the first few days after infection, the skin reaction may be of the delayed, tuberculin type. At the beginning or during the second week after infection, the reaction to intracutaneous trichinella antigen is of the immediate type.

"Precipitins appear in the blood as early as the second week after infection, but usually during the fourth week." C. L.

JACKSON (R. B.). **Some Observations on the Occurrence of Filarial Infection in Mosquito and Man in the Colony of Hong Kong.**—*Chinese Med. Jl.* 1936. Dec. Vol. 50. No. 12. pp. 1767–1772.

Morning catches of mosquitoes made in dwelling places, mostly huts, show that the most important carrier of filariasis is different in different parts of the area, if the larval filariae in mosquitoes were those of *W. bancrofti*. In Little Hong Kong it is *Anopheles minimus*, in the Shin Mun Labour Camps it is *A. jeyporiensis candidiensis*. Locally *Microfilaria malayi* has not been seen.

At Little Hong Kong there were made during 4 years 11,169 dissections of *A. minimus* with 152 infections, the corresponding numbers for *A. jeyporiensis candidiensis* being 424 and 8 and for *Culex fatigans* 1,104 and 16; the second is then the better intermediate host, but the first was the most dangerous locally. In collections made over 3 years at Shing Mun Camp *A. jeyporiensis candidiensis* was the most dangerous insect reported—92 infections in 19,965 dissected, the infections in 4,818 *A. minimus* varied much from year to year, falling from 0·7 to 0·09, while in 12,075 *A. hyrcanus sinensis* 6 infections in 3 years [the percentage of 0·77 from 4 infections among 5,245 dissections in 1934 is of course a misprint for 0·07]. *C. fatigans* was apparently not caught at this labour camp.

In experimental feedings of mosquitoes bred from larvae or pupae and fed on blood with 199 microfilariae to 20 cmm., the percentage becoming infected and the average and maximum numbers of larvae undergoing development in any insect were for *C. fatigans* 78·6, 5·2, and 48, for *A. hyrcanus sinensis* 33·3, 7·1 and 43. When fed on a man having 66 microfilariae [presumably in 20 cmm. of blood], the corresponding figures were for *A. minimus* 40, 1·5 and 2, for *A. maculatus* 36·4, 6·7 and 18, for *Aedes (F.) togoi* 50, 4·87 and 14, and for *Aë. albopictus* 0 of 8. C. L.

GEBERT (S.). **Notes on Filariasis and its Transmission by Mauritian Anophellines.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 477–480.

Infection of man and mosquito with *Wuchereria bancrofti* in Mauritius has been studied.

Blood films of 1,683 persons admitted to the Civil Hospital and examined at an unstated hour showed these percentages of infection :— In St. Louis, males 9·1, females 3·0 ; in other districts, males 11·6, females 3·1. No satisfactory explanation of the higher rate in males could be found. The infection rate varied much, even in different parts of St. Louis, being as high as 28, and highest near streams or open drains.

" The figures obtained do not show the actual infection rate for there is a definite periodicity, filarial embryos disappearing from the circulation from time to time for periods of several days' duration. Furthermore, slight infections are easily overlooked. The season of the year also appears to influence the occurrence of embryos in the peripheral blood. These are generally more numerous in the cool season, with the result that a higher percentage of cases is detected at this time of the year. Another effect of this variation is the greater transmission in winter in the coastal belt where the temperature does not fall low enough to produce a decrease in the number of anophelines."

Infection is carried by *Culex fatigans*, *Anopheles costalis*, *A. funestus* and *A. maculipalpis*. Development in the second and third insects was complete in 16, in the last in 19, days, but was not complete in *A. mauritianus*, the temperature being between 17·7°C. and 32·7°C., mean about 20°C. C. L.

KHALIL (M.). Filariasis and Elephantiasis in Rossetta and the Means of their Effective Control.—*Jl. Egyptian Med. Assoc.* 1936. Dec. Vol. 19. No. 12. pp. 701-716. With 5 figs. & 1 folding map.

Elephantiasis is so common in Rossetta that its name in Arabic is Rossetta leg.

In 1,000 blood examinations on unselected persons taken from 5 different parts of the town the incidence of *Mf. bancrofti* was 10·2 per cent., while 18 of them had elephantiasis of one or both legs. What is locally named erysipelas is common. The percentage of infection outside, but near, the town is low. There are over 1,000 wells in the town with brackish water unfit to drink, the percentage of salt being 0·7, for at low Nile the sea comes up here. Drinking water is got either by storing Nile water in cisterns under houses to which it is carted during high Nile, or by a pipe supply which about a quarter of the houses take and have to pay rather heavily for. Accordingly, for washing purposes the wells are still in use. In nearly a quarter of them *Culex pipiens* breeds, the proved host of *W. bancrofti* in Egypt. Compulsory closing of wells and cisterns is advised. C. L.

O'CONNOR (F. W.). Filariasis in Antigua.—*Jl. Trop. Med. & Hyg.* 1937. Feb. 1 & 15. Vol. 40. Nos. 3 & 4. pp. 25-31 ; 42-48. With 1 map & 1 chart. [44 refs.]

A study of 2,537 persons (1,116 males and 1,421 females) by questioning, physical examination and blood examination.

The island is a rough oblong of 108 sq. miles, in latitude 17°N., with an average rainfall of 45 in., and made up of 3 strips which, from north-east to south-west, are—undulating limestone always less than 500 feet above sea level and swept by the eastern trades, a central clay strip rarely more than 50 feet above sea level, and a volcanic strip going as high as 1,330 feet. After taking up the general

and medical history, the note on that of filariasis makes a start with elephantiasis as reported by HENDY in 1784. The population is about 33,000 with 90 per cent. negro or mulatto. The study was made between 8 p.m. and midnight, or sometimes as late as 2 a.m., and included examination of epitrochlear and sublingual glands (not the inguinal glands, venereal disease being common) and of the limbs, and in males of the scrotum for hydrocele and cysts of the epididymis. Finger blood was taken to the amount of 20 cmm. As to the counts of microfilariae, note is made that since numbers vary at the different hours at which blood was taken, these are not the whole picture, but are at least significant.

As between the three strips of which the island is made, the percentages in the volcanic strip, the clay strip and the limestone strip are--microfilariae in blood, 21, 26.3, 19.5; symptoms with no microfilariae, 7.8, 12.3, 3.66; elephantiasis with no microfilariae 2.8, 5.1, 2.1; total with filariasis 31.3, 43.8, 25.3; and the percentage of persons on Antigua with evidence of filariasis is 38.5. As to the cause of this, the houses are mostly shacks of 1 or 2 rooms, in which 8 to 16 persons sleep, with all possible sources of ventilation shut at night and swarms of mosquitoes active. Family prevalence of filariasis is high, in one family of 13 all had symptoms, though only 2 were still infective with microfilariae in the blood. Nearly all cases of elephantiasis were of the lower limbs and 48 of 124 gave no history of lymphangitis or adenitis. There had been abscess in 17, with microfilariae in the blood in 4. Iliac abscess should be specially in mind. A varicose lymph gland was seen once only on a clinical scale, though microscopically the condition is common. *Culex fatigans* has natural, and was given artificial, infection and can complete its development all the year round, at least near sea level. Enlarged glands are treated with caution as a sign of filariasis, for syphilis and yaws are present. *Mf. ozzardi* was present, among others, in two persons who had never left the island and *Culicoides furens* is present in some parts of the coast. The Feines Institute is a centre of infection.

C. L.

GALLIARD (Henri). À propos de l'attraction des microfilaries de Bancroft par la sécrétion salivaires des moustiques. [**Attraction of *Microfilaria bancrofti* by the Salivary Secretion of Mosquitoes.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. July-Aug.-Sept. Vol. 14. No. 7. pp. 977-980.

It is concluded that the salivary secretion of certain mosquitoes has an attraction for *Microfilaria bancrofti*.

With small infections there was held to be a feeble attraction by *Culex fatigans*, *Anopheles sinensis* and *Mansonia indiana* and absolutely none with *Stegomyia fasciata*, *Stegomyia albopicta* and *Armigeres obturbans* in spite of the large quantity of blood taken by the last. In *C. fatigans* there may be 5 times to a third as many in the mosquito's stomach as in the same quantity of circulating blood, in *A. sinensis* from twice to a fifth, in *A. argenteus* none where there were 16 in a drop of blood. Examination of blood from the bitten point has given no evidence of attraction to it.

[The bit of evidence missing, but necessary before the author's conclusion may be taken as correct, is the extent to which different

mosquitoes pass plasma, corpuscles and microfilaria *per anum* while or after they feed. O'CONNOR has shown the presence of such passage of microfilariae by *C. fatigans*.] C. L.

GALLIARD (Henri). Infestation expérimentale de *Mansonia indiana* Edwards avec les embryons de la filaire de Bancroft, au Tonkin. [Experimental Infestation of *Mansonia indiana* with Embryos of *W. bancrofti*, in Tonking.]—*Ann. Parasit. Humaine et Comparée*. 1936. Sept. 1. Vol. 14. No. 5. pp. 495-496.

Mansonia indiana is unlikely to be an important factor in the spread of infection by *W. bancrofti* in the Tonking delta.

While the percentage of *Culex fatigans* fed on an infected man was 80, that in *M. indiana*, apparently in like conditions was 10,—2 of 20 kept for 15 days at a temperature between 28° and 30°C. C. L.

SUAREZ (Jenaro). Clinical Findings in 139 Cases of Recurrent Tropical Lymphangitis.—*Puerto Rico Jl. Public Health & Trop. Med.* 1936. Sept. Vol. 12. No. 1. pp. 81-99. With 10 figs. & 2 plates. [13 refs.] [Spanish version pp. 100-113.]

A clinical discussion of 139 persons with recurrent tropical lymphangitis seen by Suarez in Porto Rico.

The prevalence is highest from June to September and highest of all in August. Taking all age decades in order from birth to 69 years, the total sufferers in each decade were 10, 31, 22, 22, 6, 7 and 2*; the site was one leg in 81, two legs in 13, and other parts in six. In most cases attacks took place once a month or oftener; there was relapse, usually within 2 or 3 days, in four. Elephantiasis was present in 18, and high degrees of it were twice as common in blacks as in whites. The bacterial rôle is discussed in view of the work by DRINKER and his colleagues. The attack has always begun with a rigor, the rash has always progressed upwards. "Abscesses, cellulitis, and thrombophlebitis may be easily mistaken for recurrent lymphangitis. On the whole, it is easier to mistake other diseases for recurrent lymphangitis than to mistake lymphangitis for other diseases." C. L.

PONS (Juan A.). The Treatment of Recurrent Tropical Lymphangitis with Special Reference to the Therapeutic Value of Streptococcus Vaccines and Filtrates.—*Puerto Rico Jl. Public Health & Trop. Med.* 1936. Sept. Vol. 12. No. 1. pp. 114-139. [24 refs.] [Spanish version pp. 140-167.]

"The results of the treatment of a group of cases with bacterial products—vaccines and filtrates—through a period of two years, seem to justify this preliminary report."

"From this study it seems that a vaccine made from streptococci isolated from cases of recurrent tropical lymphangitis during acute attacks is of value in preventing recurrences, for a time at least, in certain cases of this disease, and is capable of reducing the intensity or relative frequency, or both, in others. It can be estimated that about 40 per cent. of all patients so treated may be benefited. The addition of strains other than those of tropical lymphangitis does not seem to make the vaccine any more effective.

"Filtrates of cultures of streptococci isolated from these same cases seem to be even more effective than vaccines in preventing recurrences

* Unless otherwise stated all figures are percentages.

and reducing the severity, or the frequency, or both, of the pyrexial attacks. It seems as if it might be expected that about seventy per cent. of cases be so benefited when treated with such filtrate in appropriate doses, intradermally or subcutaneously, or the two."

C. L.

MORALES OTERO (P.) & POMALES LEBRÓN (A.). **Immunological Response of Cases of Recurrent Tropical Lymphangitis to Haemolytic Streptococci and their Products.**—*Puerto Rico Jl. Public Health & Trop. Med.* 1936. Sept. Vol. 12. No. 1. pp. 43–66. With 1 fig. & 9 charts. [14 refs.] [Spanish version pp. 67–80.] [Summary appears also in *Bulletin of Hygiene.*]

Agglutinins against haemolytic streptococci were demonstrated in nearly every case of recurrent tropical lymphangitis (68 examined). They were also demonstrated in patients suffering from other diseases and in normal individuals but in lower concentration. Many cases of tropical lymphangitis gave allergic reactions to skin injections of haemolytic streptococcus filtrate. This allergic reaction disappears during the febrile periods of the disease. Antistreptolysin determinations were made in cases of recurrent tropical lymphangitis, in normal cases, and in cases of other diseases. There is a definite increase in the antistreptolysin content of the blood of most cases of tropical lymphangitis as compared with normals. As a rule there is an increase in antistreptolysin from one to seven days after the onset. At a later stage the values gradually decrease. Plasma clot from patients with tropical lymphangitis develops a definite resistance to the fibrinolytic activity of haemolytic streptococci. The definite increase in antistreptolysin in tropical lymphangitis is evidence that acute attacks of the disease are preceded by haemolytic streptococcus infection.

C. C. Okell.

RAY (P. N.). **Some Observations on Filariasis and its Complications.**—*Calcutta Med. Jl.* 1936. Sept. Vol. 31. No. 3. pp. 121–131. With 14 figs. on 3 plates. [16 refs.]

A survey of pertinent literature with personal observations, clinical and histological.

The literature will be within the knowledge of *Bulletin* readers. In Ray's experience a culture from an acute filarial condition has been mostly negative for streptococci or other bacteria, and it would be interesting to know whether his exceptions have been early examinations. As to the cause of microfilarial periodicity "the present writer can testify to LANE's views from personal experience and observation. In every instance the female worms, alive at the operation before midday, showed the same stage of pregnancy and extreme distention with embryos." In two instances blood containing microfilariae was used in transfusion, their presence not coming to knowledge till later. None was seen when the blood of the receivers was examined by ordinary methods 2 days later.

C. L.

ROMITI (Cesare). **Filariasis in British Guiana. Comments on Criticisms on Previous Publications of my Research in this Disease, and Correction of Mis-Statements attributed to me.**—*Brit. Guiana Med. Ann. for 1936.* pp. 54–65.

CLAVIER (G. Patterson). "Brevities on the Problems of Filariasis." A Resumé of the Proven Facts and Arguments on Others.—*Brit. Guiana Med. Ann. for 1936.* pp. 38–53.

MOORTHY (V. N.) & SWEET (W. C.). A Biological Method for the Control of Dracontiasis.—*Indian Med. Gaz.* 1936. Oct. Vol. 71. No. 10. pp. 565–568. With 2 figs. & 2 maps.

Although the abolition of step wells is the only permanent and fool-proof method of control of dracontiasis, much may be done by keeping certain small fish in these wells, and this is better and cheaper than the usual chemical methods.

As the photographs in the paper show, a step well is really a considerable water reservoir, down into which it is possible, by natural or artificial steps, for a number of people to walk at the same time. In the Chitaldrug district those in the 250 villages which used them only were treated in 1 of 4 ways. A platform from which to draw water was made and the "well" itself enclosed by a parapet, new draw wells were made, the step wells were treated fortnightly from December to May, the season of transmission, with perchloron* or copper sulphate, or they were stocked with cyclops-eating fish.

These last are *Barbus* (*Puntius*) *puckelli*, *B. (P.) ticto*, *Lepidoccephalocythus thermalis*, *Rasbora doniconius*, *B. sophore*, *B. chola*, and *Gambusia* species imported from Italy. The first of these is the only one from whose ani the guineaworm embryos do not come out; from the others the embryos emerge, weak certainly, but still alive. *L. thermalis* is a bottom feeder having among its food, eggs of and young copepods. Details of work in two villages are given. Fish were put into step wells of 35 villages; in 6 there is no longer guineaworm infection, in 4 it is much less. The details are these:—

"The first measure in routine control of guinea-worm disease by fish is the establishment of hatcheries from which the various species will be always available. In the Chitaldrug district this has been done in 73 taluk and hobli headquarters. It should also be noted that each successfully-controlled step-well can become a hatchery for the supply of fish to neighbouring villages.

"Any step-well to be stocked with fish should be previously treated with perchloron (3 lbs. to 100,000 gallons) until it is free of cyclops. Should this measure result in odour due to decaying organic matter, a small dose of potassium permanganate will remedy matters. The perchloron, if used properly, will kill many of the predaceous species of fish and leave the well free for the smaller species used in control. It is best to encourage the villagers to bail out the wells and remove silt before the treatment with perchloron is used.

"About 100 specimens of each species of fish used for control should be freed in the well about one month after the dosing with perchloron."

Then there is this curious behaviour recorded.

"The *Barbus* species used in control of cyclops will cluster around the submerged portions of the body of people using the step-well and pull at hairs and loose epidermis enthusiastically. This habit has been noted by the village people and it is made use of in some areas as a treatment for certain types of skin diseases and ulcers."

C. L.

* Perchloron is the name given to a bleaching powder substitute $\text{Ca}(\text{OCl})_2$, containing 70–75 per cent. Cl, and easily soluble in cold H_2O .

MOORTHY (V. N.) & SWEET (W. C.). **Guinea-Worm Infection of Cyclops in Nature.**—*Indian Med. Gaz.* 1936. Oct. Vol. 71. No. 10. pp. 568–570.

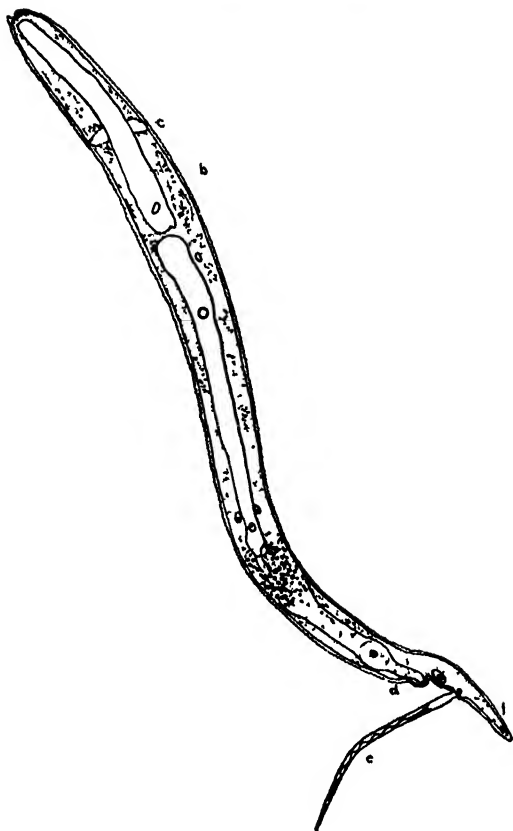
Examinations were made of 1,874 *Mesocyclops leuckarti* and 3,279 *M. hyalinus* in nature. Of the first 1·8, and of the second 1·3 per cent. were infected.

“Cyclops naturally infected by guinea-worm larvae were found in a step-well in the Chitaldrug district of Mysore State in January and February 1936, at a time when there were in the village several cases of dracontiasis in the early stages. Although *M. leuckarti* had the higher infection rate, the actual number of *M. hyalinus* infected was greater; this was due to its numerical preponderance. No infections were found in other species of cyclops and none of the infected specimens were fully-mature females bearing ovisacs; all infections were in the younger forms of both sexes. That the naturally-infected cyclops could transmit dracontiasis was demonstrated by the finding of immature guinea-worms at autopsy of a dog which died 67 days after a feeding of 88 naturally-infected cyclops.”

C. L.



Photomicrographs of type A guinea-worm embryo with laterally placed tail, and of type B guinea-worm embryo, obtained from the same adult female worm [see p. 466].



Camera lucida drawing of type A guinea-worm embryo, having a peculiar posterior end with a laterally placed tail (a) Sharp pointed, triangular projection seen in the anterior margin of the lower lip, (b) oesophagus, (c) nerve ring, (d) knob-like projection, (e) laterally placed tail, (f) posterior narrowed portion of the embryo

[Reproduced from *Indian Journal of Medical Research*]

MOORTHY (V. N.) & SWEET (W. C.). **A Peculiar Type of Guinea-Worm Embryo.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 531-534. With 1 text fig. & 3 figs. on 2 plates.

A new type of guineaworm larva is described.

In 6 of 10 patients the new type of larva was seen in hundreds, those of the ordinary type in millions. Their numbers were greatest at the opening of the blister and when the part was sprayed with ethyl chloride. This is the author's description, Type A being the new, Type B the old, form.

"The type A embryo is about three-quarters the length of type B and is slightly stouter. A small triangular projection with a pointed end, resembling the small dorsal spine seen in camallanus larvae, can be seen near the anterior margin of one of the lips. Other structures seem to be much the same as those found in type B embryos and it is only at the tail-end that a decided difference exists. In type B the tail is in continuation with the body and gradually tapers to a point, whereas in type A a characteristic knob-like structure is seen projecting to one side of the

larva below which the embryo suddenly becomes very narrow. From about the middle of this narrow portion a thin tail-like structure, which ends in a sharp point, projects out laterally and is about half as long as the corresponding tail of type B. Average measurements of 20 embryos of each type, fixed and stained by the writer's method."

In these conditions the measurements, in millimetres, are those for Types A and B respectively: length 0.434 and 0.61, greatest breadth 0.023 and 0.1624, length of oesophagus 0.112 and 0.1358, anterior end to nerve ring 0.056 and 0.0672, length of tail 0.098 and 0.1582. After examination of thousands of infected cyclops one larva was seen and is held to be of Type A; it is slightly shorter than the other and its tail has what seems to be a stumpy ventral process. It is suggested that the types may be sexual. The method of staining will be published in a paper by Moorthy.

[As has been pointed out to me, the curious caudal projection of the newborn larva (which seems to be ventral, not lateral) has the appearance of a small but complete nematode larva with oesophagus and zigzag intestine.] C. L.

RAO (S. Sundar). **The Effect of Gastric Juice and of Bile on Cyclops infected with Guinea-Worm Larvae.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 535-540.

"Cyclops infected with guinea-worm larvae are killed rapidly by hydrochloric acid even in very low concentrations; concentrations of 0.2 per cent. and higher have an immediate lethal effect on cyclops, while a concentration of 0.025 kills in 15 minutes. In all these cases the guinea-worm larvae are activated.

"Fresh gastric juice is lethal to cyclops, whatever may be its acidity concentration. Gastric juice with acid (total acids) concentrations varying between 0.15 to 0.026 per cent. kills cyclops in two minutes, much more quickly than hydrochloric acid of the same concentration. In some cases gastric juice containing no free acids whatsoever was found equally effective in killing cyclops. It appears that the combined acids in the gastric juice are as lethal to cyclops as HCl.

"Bile is lethal to cyclops, but when diluted its effect is greatly delayed. One per cent. bile has very little action on cyclops.

"The gastric juices play an important rôle in the establishment of guinea-worm infection in man by killing the cyclops and activating the guinea-worm larvae. It is not understood how bile could play any part in the above process; any cyclops that would reach the duodenum would have been already killed by the gastric juice which is lethal to cyclops even when it has a very low acid concentration." C. L.

BABUDIERI (B.). Un caso di filariasi nell'uomo, da *Filaria conjunctivae* Addario, 1885, osservato in Italia. [**A Case of Filariasis Conjunctivae in Man.**]—*Riv. di Parassit.* Rome. 1937. Jan. Vol. 1. No. 1. pp. 53-67. With 6 figs. on 1 plate. [32 refs.] English summary (6 lines).

"The A. reports all cases known up to the present of human filariasis due to *Filaria conjunctivae* Addario 1885 and adds a case observed personally in a boy at Pieris (Trieste). The A. describes the parasite and the pathological state brought about by the worm."

C. L.

DAMPF (Alphonse). Les cératopogonidés, agents transmetteurs de filaires. [Filarial Transmission by Culicoides.]-*Bull. Office Internat. d'Hyg. Publique*. 1936. Oct. Vol. 28. No. 10. pp. 1955-1960.

A survey of literature and a record of Dampf's own work in Mexico. The dissection, about Chiapas, of 107 *Culicoides*, apparently all of the same species, showed no microfilariae in the head, stomach or abdominal cavity, but in the thoracic muscles larvae of 2 sizes were found, one corresponding to that of *Onchocerca volvulus* and the other to that of *O. cervicalis* of the horse in England. The author is unsatisfied with the classification of the genus. Citronella is of little use in keeping the insects off, they get into the hair and creep down to the skin and, where the bite is, there the cyst may form, though the larva may travel in the body to some other spot
C. L.

VAN DEN BERGHE (L.). Note préliminaire sur la localisation extra-nodulaire de "*Onchocerca volvulus*" chez l'homme. [Extra-nodular Localization of *O. volvulus* in Man.]-*Ann. Soc. Belge de Méd. Trop.* 1936. Dec. 31. Vol. 16. No. 4. pp. 549-551.

In two autopsies female *O. volvulus* has been found outside nodules.

It is certain that *Mf. volvulus* is got from the skin in persons in whom no nodules can be found, and that in the case of other species of the genus in animals the worms may live outside nodules. The observation of Dyce SHARP of the escape of an adult worm from an abscess of the foot is noted, but it is felt that it might have come from a nodule broken down by suppuration. Then two instances are given in which after a minute search at autopsy, worms were found unenclosed in fibrous nodules.

The first, a person of 60, had three nodules about the left and one about the right trochanter, one on the right iliac crest and in addition a coiled up female worm was present in the fatty tissue about the right trochanter, but with no surrounding fibrosis. The second, a person of 25, had three nodules over the right ribs, one on the right iliac crest and one over the left trochanter. A female worm, not rolled up and with no capsule, was found in dense connective tissue about the left trochanter. A lens is needed in such investigations. This preliminary note is written because the find must modify hypotheses hitherto held, and certain conceptions on the pathogenesis and treatment of this infection. [It is but just to quote from Dyce SHARP (see this *Bulletin*, 1926, Vol. 23, p. 761). Speaking of 100 unselected prisoners at Kaduna, Nigeria, he noted "the presence of embryos of *O. volvulus* in the skin of 55 . . . Of these 55, only 17 or 30 per cent. exhibited parasitic tumours, and that after prolonged and careful search . . . No one has yet described the finding of these peculiar tumours in the deeper tissues . . . The existence of human onchocerciasis in the absence of tumour formation is not yet admitted by so great an authority as Professor BRUMPT . . . Only by finding the adult filaria at an autopsy on a carrier can this point be definitely cleared up." They are now reported (unenclosed by the action of the host's reticulo-endothelial system) eleven years later. The lag is not unusually long for Tropical Medicine.]
C. L.

AFRICA (Candido M.) & GARCIA (Eusebio Y.). **A New Nematode Parasite (*Cheilospirura* sp.) of the Eye of Man in the Philippines.**—*Jl. Philippine Islands Med. Assoc.* 1936. Oct. Vol. 16. No. 10. pp. 603–607. With 3 plates.

The worm was placed in the genus *Cheilospirura* after examination of two portions broken off from the mass in which it lay in the conjunctiva, and from sections of part of that mass.

A man of 70 had conjunctivitis 7 months after waking one night and expressing dark mudlike material from the right eye. When seen he had a tumour inside the lower lid, size 1×0.8 cm. with 4 small openings at one end and two whitish threadlike objects 0.2 mm. wide and about 5 mm. long projecting from the other. These were pulled off and part of the tumour cut out. One was of a head end whose description is not understood, but which speaks of "a dorsal and a ventral pair of double, cuticular cordons originating from the base of the lips" and which seemed to go far back, since they were seen in the second fragment which "appears to have been taken from the middle portion of the body, or at least beyond the oesophageal region." Of the eggs seen free in sections of the tumour only a few were embryonated, they were thick-shelled and measured 28 by 18μ .

C. L.

PALAZZO (Marco Quinto). Uretorrhagia da infestazione di *Limnatis nilotica* osservata in un indigeno della Cirenaica. [**Urethral Haemorrhage due to *Limnatis nilotica*.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Dec. Vol. 17. No. 12. pp. 745–750. With 2 figs. & 1 map.

The patient was a man of 70 years, a native of Bengari, suffering from haematuria. On examination an elongated brownish coloured body was seen a few millimetres from the meatus, resembling a blood clot. It clung to the wall, but was finally removed; it proved to be one of the Hirudines, *Limnatus nilotica*, and when fully extended measured 7–8 cm., when retracted 1–1.5 cm. A successful treatment is by irrigation with 2 per cent. acetic acid; equally efficacious is Dujardin-Beaumetz solution, 1 in 4. (This contains carbon bisulphide 25 parts, essence of mint 2 parts, distilled water 500 parts.) The patient had acquired the leech when bathing in a neighbouring spring.

H. H. S.

NORONHA (A. J.). A Nematode Worm passed in the Stools by a Patient suffering from an Irregular Pyrexia of Obscure Origin.—*Jl. Trop. Med. & Hyg.* 1937. Jan. 1. Vol. 40. No. 1. pp. 1–4. With 7 figs. & 1 chart.

THE TYPHUS GROUP OF FEVERS.

LE CHUITON. Les principales fièvres exanthématiques groupées selon leurs particularités épidémiologiques. [**Epidemiological Classification of Typhus Fevers.**—*Arch. Méd. et Pharm. Nav.* 1936. Apr.-May-June. Vol. 126. No. 2. pp. 233-272.

The various members of the typhus group of diseases are discussed and the classification of Nicolle is adopted: the 2 main groups are—*Group A.* The vectors are insects—lice and fleas.

(1) Epidemic and endemic typhus. *X19* is the main agglutinin.

Group B. The vectors are arthropods—ticks and mites.

(1) Rocky Mountain fever.

(2) *Boutonneuse* fever.

(3) Japanese River fever.

X19 group agglutinins in some, *XK* in others.

This classification is roughly in agreement with that of PINKERTON [see this *Bulletin*, 1936, Vol. 33, p. 907] although arrived at by different methods. Each member of the groups is then discussed as regards aetiology, transmission, clinical features, prophylaxis, vaccination, etc., special consideration being given to endemic typhus, which the writer of the paper has investigated on board the French men-of-war in Toulon Harbour. It is specially noted that endemic or murine typhus occurs among members of the ship's company who live on board the vessels in the harbour and these men do not contract *boutonneuse* fever, whereas other people who live on shore contract *boutonneuse* fever and do not get endemic typhus. D. Harvey.

BALAZET (M. L.). Rickettsies et Rickettsioses. [**Rickettsia and Rickettsial Infections.**—*Rev. Gén. de Méd. Vét.* 1936. July 15. Vol. 45. No. 535. pp. 385-408. With 3 figs.

A very complete review of the subject of the *Rickettsia* of man, arthropods and animals.

The subject is considered under morphology, culture, filterability, immunity, etc.

The Rickettsioses are grouped as follows—

(1) Typhus, paratyphus group.

(2) Japanese River fever group.

(3) Rocky Mountain fever group.

(4) Heart water group.

(5) Trachoma, etc.

An excellent table is given showing the disease, vector, distribution, etc. D. H.

HASS (George M.) & PINKERTON (Henry). **Spotted Fever. II. An Experimental Study of Fièvre Boutonneuse.**—*Jl. Experim. Med.* 1936. Oct. 1. Vol. 64. No. 4. pp. 601-623. With 8 figs. on 3 plates. [20 refs.]

In a previous paper [this *Bulletin*, 1936, Vol. 33, p. 907] PINKERTON has postulated certain differential criteria which are necessary for the accurate classification of the typhus fevers; as a result of these studies the author divides the Rickettsial diseases into 2 genera: (1) *R. prowazeki* typhus, (2) *R. rickettsi*, or *Dermacentroxenus rickettsi*, spotted fever.

In the present paper these criteria are now applied to the virus of *boutonneuse* fever and this virus is classified in the second genus as a sub-species.

Criteria for classification.

1. Clinical course in man ; mild cases of spotted fever cannot be differentiated from *boutonneuse* fever but in the latter disease a primary sore and adenitis are nearly always present.

2. Weil-Felix reaction ; *boutonneuse* fever and spotted fever both give a modified or group reaction for *OX19* and do not agglutinate *OXK*.

3. Clinical course in guineapigs ; the mortality is much greater in spotted fever, but in both cases scrotal reaction is present.

4. Study of smears of scrotal sac exudate in guineapigs.

In guineapigs infected with *boutonneuse* fever virus *Rickettsia* which are similar in morphology to the *Rickettsia* of spotted fever are found in small numbers in the cytoplasm of the cells and also in some instances in the nuclei.

5. Histopathology in man and animals.

In the guineapig a condition of thrombo-angitis with necrosis is found in the tunica of animals infected with *boutonneuse* fever virus ; this agrees with the findings in spotted fever and differs from typhus fever.

6. In sections of tissues from infected guineapigs *Rickettsia* could also be detected in the nuclei of the cells.

As no fatal cases of *boutonneuse* fever were met with it was not possible to compare the conditions with those found in spotted fever in man.

7. Crossed immunity.

The blood from guineapigs dying of spotted fever was injected into 6 guineapigs which had recovered from *boutonneuse* fever, none of the 6 reacted, all were immune. It was interesting to note, however, that spotted fever tick vaccine does not protect guineapigs from *boutonneuse* fever virus although it does protect against the homologous virus.

8. Study of the micro-organism in the arthropod vector.

In ticks infected with the virus of *boutonneuse* fever the *Rickettsia* were seen in the nuclei of the cells in 4 instances ; also the micro-organisms were noted throughout the viscera of the tick exactly as is the case in spotted fever.

9. Tissue culture of virus.

Here also the *Rickettsia* of *boutonneuse* fever virus were found in small numbers in the cytoplasm of the cells and also within the nuclei.

The conclusions are that the *Rickettsia* of *boutonneuse* fever resemble those of spotted fever in morphology, they invade the same type of cell, they do not fill up the cytoplasm of the cells but may be found in the nuclei of the cells, and the distribution in the tick is the same.

D. H.

BUSH (F. Keith). **Typhus Fever in the Simla Hills.**—*Jl. Roy. Army Med. Corps.* 1936. Sept. Vol. 67. No. 3. pp. 158-172. With 6 charts.

In the Simla hills in 1932 there were 5 cases of typhus with 2 deaths, in 1933, 14 cases with 1 death, in 1934, 15 cases with no deaths. The

6 cases which occurred in 1935 are described in this paper. Temperature charts and the serological results are included. The cases occurred, as in previous years, towards the end of the rainy season. Graphic accounts of the early stages of their illness are given in their own words by 3 of the soldiers.

Headache was the prominent symptom in all the cases, usually accompanied by pain on movement of the eyes. Insomnia was noted in all cases. The fever lasted for 15 to 21 days and terminated by lysis. Rigors, double and repeated, were an early, marked and constant feature. The rash was not a striking symptom and was noticed in only 3 out of the 6 cases.

Positive agglutination with *Proteus* OXK was obtained in all the 6 cases. In 3 cases OX19 and OX2 were also agglutinated.

In one case a small boil or ulcer was noted on the leg with inflamed lymphatics and enlarged and painful glands, probably a primary sore ; in no case was any tick or mite discovered. D. H.

COVELL (G.) & MEHTA (D. R.). **Studies on Typhus in the Simla Hills. Part VI. The Role of the Human Body-Louse in the Transmission of Typhus.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 389-397. With 3 charts & 1 plate. [10 refs.]

A monkey was inoculated with a local strain of murine typhus, lice were fed on this monkey ; of 60 of these lice which were dissected 3 showed enormous numbers of *Rickettsia* in the gut, *i.e.*, 5 per cent.

The remaining lice which had fed on this monkey were then fed on a clean monkey. This monkey developed fever later and the Weil-Felix reaction, which had been negative, became slightly positive. Blood was taken from this monkey during the fever and inoculated into guineapigs ; they also developed slight fever but none showed any scrotal reaction.

Some of the lice were crushed and rubbed into the scarified skin of another monkey, this animal also developed fever and so also did guineapigs inoculated with the blood, but none showed any scrotal reaction ; this particular strain of murine virus gave, as a rule, a marked scrotal reaction in guineapigs. D. H.

LEWTHWAITE (R.), HODGKIN (E. P.) & SAVOOR (S. R.). **The Typhus Group of Diseases in Malaya. Part VI : The Search for Carriers.**—*Brit. Jl. Experim. Path.* 1936. Aug. Vol. 17. No. 4. pp. 309-317.

A stock of laboratory bred *X. cheopis* was obtained and batches of these "clean" fleas were used in experiments with the viruses of urban and rural typhus. White rats were inoculated with the virus of urban typhus and fleas were fed on them for 15 days, some of these fleas were then taken and emulsified and injected into 4 guineapigs, all 4 became infected. *Rickettsia* were found in the fleas in large numbers. Thirty-eight fleas were taken from the box in which they had fed on the infected rat and were placed in a clean box into which 2 white rats were put ; these rats were killed after an interval and the brains proved to be infective. The infected guineapigs were later tested with the virus of urban typhus and were immune. The whole experiment was repeated, with the same result. Similar experiments were carried out with rat fleas with the virus of rural typhus ; all

were negative. In a footnote it is stated that in further trials there was some evidence of infection. Fleas infected with the virus of urban typhus produced infection when rubbed into the scarified skin of guineapigs; so did the *faeces* of the same fleas.

Ticks in urban and rural typhus.—The ticks employed were *Dermacentor andersoni* and *Rhipicephalus sanguineus*. These were fed on guineapigs infected with the virus and subsequently on clean guineapigs; there was no evidence of infection. Two hundred ticks were used.

D. H.

LEWTHWAITE (R.) & SAVOOR (S. R.). **The Typhus Group of Diseases in Malaya. Part VII: The Relation of Rural Typhus to the Tsutsugamushi Disease (with Special Reference to Cross-Immunity Tests).**—*Brit. Jl. Experim. Path.* 1936. Dec. Vol. 17. No. 6. pp. 448-460. [22 refs.]

In the early days when scrub typhus and urban typhus were first detected in Malaya, it was shown on serological and epidemiological grounds that the diseases were distinct and separate. It was also considered that scrub typhus and tsutsugamushi fever, as it occurred in Malaya, were separate and distinct and this for two main reasons: (a) in scrub typhus there was no primary sore at the site of the infecting bite, (b) cases of scrub typhus gave a higher titre of agglutination for OXK than did cases of tsutsugamushi fever; however, further experience has shown that the latter observation is not reliable, therefore the only difference still remaining between these diseases is the presence or absence of a primary sore. It has been demonstrated that the causal organisms in scrub typhus and tsutsugamushi fever are *Rickettsia* and they are identical in morphology, in numbers, distribution and staining characteristics. Guineapigs, rabbits and monkeys are all susceptible to the two viruses and the reactions in these animals are similar. The most important reaction from this point of view is the reaction in the eye of the rabbit and the production of an initial lesion in the skin in the rabbit and monkey when the virus is injected intradermally. Also, the results of the Weil-Felix reaction in the sera of rabbits inoculated with the viruses of scrub typhus and tsutsugamushi fever are the same.

In the present paper this research is carried a stage further and the results of an elaborate series of cross immunity experiments are recorded.

In brief, it may be stated that these experiments show that there is definite and complete cross immunity between the viruses of scrub typhus and tsutsugamushi fever both by the intraocular and intra-dermal reaction in rabbits and monkeys and by the Weil-Felix reaction in rabbits.

Rabbits inoculated with either virus gave a positive reaction for OXK and when inoculated later, either with the homologous or heterologous virus, there was no stimulation of the agglutinins for OXK.

In discussing the results of their researches the authors consider that scrub typhus and tsutsugamushi fever are identical in all known features of aetiology, epidemiology, serology and experimental infection of laboratory animals, the clinical symptoms in man are also the same except for the occurrence of the primary sore in the tsutsugamushi cases. The results of the successful cross immunity experiments recorded in this paper add a further and conclusive addition to

the evidence of identity. The authors ask, is this single clinical feature, the presence or absence of a primary ulcer, enough to separate the two diseases? The answer is in the negative; they consider scrub typhus and tsutsugamushi fever to be one and the same disease, and the name scrub typhus might be dropped.

It has been suggested that the presence or absence of a primary sore may depend on whether the bite is intradermal or subcutaneous: in the one case a mite might be the vector, in the other the tick. The authors consider that such a supposition is unnecessary, the true explanation being that in some cases of the fever the primary sore is so small and fleeting that it is not noted and this is especially the case in the dark and thick skinned native of India or Malaya.

An instance is quoted of an outbreak of fever in one estate where 4 out of the 6 Europeans employed developed typhus and all showed a primary sore. At the same time and place two hundred native workers developed a similar fever, but in only one case was a primary sore detected. Also in one fatal case, in a European, a small red papule was noted on the neck, the glands in the neck became swollen and later the glands in the axilla and groin of the same side, followed later by swelling of the glands on the other side of the body, the papule had completely disappeared in a day or two and there was no sign of necrosis. In some cases of so-called scrub typhus no ulcer is detected, but involvement of lymphatic glands (bubo) is well marked; whereas in cases diagnosed tsutsugamushi fever there may be a well marked primary ulcer but little or no involvement of the lymphatic glands. In short, the authors conclude that scrub typhus is tsutsugamushi fever without a primary ulcer or in which the primary ulcer has not been detected.

D. H.

LEWTHWAITE (R.) & SAVOOR (S. R.). **The Typhus Group of Diseases in Malaya. Part VIII: The Relation of the Tsutsugamushi Disease (including Rural Typhus) to Urban Typhus. Part IX: The Relation of the Tsutsugamushi Disease (including Rural Typhus) and Urban Typhus to Rocky Mountain Spotted Fever. (With Special Reference to Cross-Immunity Tests.)—Brit. J. Experim. Path.** 1936. Dec. Vol. 17. No. 6. pp. 461-472. [15 refs.]

The authors have already shown that the *Rickettsia* of urban typhus resemble *R. prowazeki* and the *Rickettsia* of tsutsugamushi fever (Malaya) resemble *R. orientalis*.

The diseases also differ in epidemiology and in clinical features. Urban typhus occurs in towns, especially in grain shops, and is almost certainly carried from rats to man by the rat flea, whereas tsutsugamushi fever occurs in the plantations and is carried by a larval mite. Clinically the diseases are somewhat similar, but there is never a primary ulcer in urban typhus and fatal cases are seldom met with. As regards experiments in laboratory animals the virus of urban typhus is readily inoculable to guineapigs and produces a scrotal reaction in the male, but not ascites. On the other hand, it is difficult to infect guineapigs with the virus of tsutsugamushi fever, scrotal reaction does not occur but ascites is constant.

In the rabbit the virus of urban typhus produces only a slight and transient reaction in the eye, but gives a positive Weil-Felix reaction for *Proteus OX19*. On the other hand the virus of tsutsugamushi

fever produces a marked reaction in the eye of rabbits and the Weil-Felix reaction is positive for *OXX*. In monkeys also urban typhus virus gives a positive Weil-Felix reaction for *OX19* and when inoculated intradermally there is no papule, whereas the virus of tsutsugamushi fever gives a positive reaction for *OXX* and produces a primary sore in the skin of the monkey.

In the present paper the results of cross immunity experiments are recorded and it is shown that there is no evidence of cross immunity between the viruses of urban typhus and tsutsugamushi fever. The two diseases are separate and distinct.

A further series of cross immunity experiments were carried out between the viruses of (a) spotted fever and tsutsugamushi fever (b) spotted fever and urban typhus. There was no evidence of cross immunity in the case of spotted fever and tsutsugamushi disease. But although there was no evidence of immunity in guineapigs which had been inoculated with urban typhus when subsequently inoculated with the virus of spotted fever, there was distinct evidence that animals which had recovered from infection with the virus of spotted fever had a degree of immunity to infection with the virus of urban typhus.

Spotted fever tick vaccine gave no protection against the viruses of urban typhus or tsutsugamushi fever, although it protected the animals against the homologous virus. *D. H.*

SUBRAHMANYAM (C.). **Tropical Typhus in Singapore.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. July 31. Vol. 30. No. 2. pp. 263–268. With 6 charts.

In Singapore General Hospital 1 case of typhus was reported in 1932, 2 in 1933, and 5 in 1934.

In 1935 all sera sent to the laboratory in the hospital were tested for the Weil-Felix reaction. Of 1,209 bloods tested 46 gave a positive reaction, 30 for the W variety, and 16 for the K. All these cases of fever were contracted in the city and it is obvious that typhus fever, both of the W and K variety, is endemic in Singapore (urban and rural). [It would be more correct to say that endemic typhus and Malayan tsutsugamushi fever are present in Singapore.] Several strains of *Proteus* were isolated from the urine of the cases. *D. H.*

BEVERIDGE (A. J.) & UNDERHILL (E.). **Notes on a Case of Japanese River Fever (Tsutsugamushi Disease) and a Case of Tropical Typhus Fever.**—*Jl. Roy. Army Med. Corps.* 1936. Dec. Vol. 67. No. 6. pp. 400–405. With 1 chart.

A case of fever in a soldier aged 26 in Singapore is described; on admission a small ulcer was noted on the left ankle and enlarged glands could be felt in the left groin; a dusky red macular rash was a prominent symptom; the patient died on the 18th day of the illness.

The Weil-Felix reaction was positive 1/250 for *Proteus OXX* and negative for *OX19*.

Another case of fever of the typhus group is described by one of the writers, this case was seen some years previously in India. The fever lasted 18 days and a profuse dusky red macular rash similar to that in the previous case was noted. The Weil-Felix reaction for *X19* was positive 1/250; there was no primary sore. *D. H.*

KLIGLER (I. J.) & COMAROFF (R.). **An Epidemic Outbreak of Murine Typhus in a Labour Group in an Inland Village in Palestine.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 363–368.

It has already been noted that the so-called epidemic virus of typhus may give rise to sporadic or endemic cases. In the present paper it is shown that the endemic virus may give rise to explosive outbreaks.

Typhus fever broke out in a small farm colony of 58 workers: in six weeks there were 43 cases, an incidence of 74 per cent. Eighty-four per cent. of the men were attacked and 64 per cent. of the women. The place was infested with rats and a murine typhus virus was readily isolated from the rats and also, but with difficulty, from fleas taken from the rats. The fever was mild in all the cases, there were no toxic symptoms and no fatalities. The Weil-Felix reaction for *Proteus OX19* was positive in all the cases. No lice could be discovered on any of the workers.

D. H.

BERRI (Nicolò). Sulla febbre esantematica del litorale mediterraneo. (Studio clinico).—*Ann. di Med. Nav. e Colon.* 1936. Sept.–Oct. 42nd Year. Vol. 2. No. 3–4. pp. 155–162. With 1 fig. [23 refs.]

GEAR (J. H. S.) & BEVAN (C.). **An Outbreak of Tick-Bite Fever.**—*South African Med. Jl.* 1936. July 11. Vol. 10. No. 13. pp. 485–488. With 1 fig. [16 refs.]

Twelve cases of typhus were investigated; all these people lived in the city of Johannesburg or in the suburbs, and none had been away from home for at least a month before the fever commenced. Two cases occurred in one family but the remainder of the cases were scattered and had no connexion with one another. The cases were clinically definite typhus and were all severe, intense headache was a predominant symptom and delirium occurred in every case. The maculo-papular rash was profuse and involved the palms and soles, fever lasted 10 to 14 days and thrombosis was noted in 2 cases. The Weil-Felix reaction became positive late in the fever and the maximum titre was obtained after the fever had ceased. *Proteus OX19* was agglutinated in high titre up to 1/3000 and *OX2* at 1/400. *OXK* was only agglutinated to 1/50 and only in one case. A primary sore and enlarged glands were noted in half of the cases only. Lice and rat fleas could be excluded, but all the patients were devoted to dogs and were in the habit of removing ticks from their dogs and crushing them with the fingers.

It is suggested that, as occurs in *boutonneuse* fever, the cases in which a primary sore could not be detected may have been infected through the conjunctiva or through an abrasion or cut on the skin.

[This paper is of importance as it demonstrates that there is in South Africa still another type of typhus fever distinct from the very mild type of "tick bite fever" with constant primary sore and bubo described by PIJPER and his co-workers and which they have shown can be carried by larval ticks which live on veld rodents. These cases described by Gear resemble closely the cases originally described in South Africa by McNAUGHT in 1911.]

D. H.

GORDON (R. M.) & DAVEY (T. H.). **The Occurrence of Tropical Typhus in Sierra Leone: a Preliminary Report.**—*Ann Trop. Med. & Parasit.* 1936. July 17. Vol. 30. No. 2. pp. 203–209. With 1 map & 1 chart. [16 refs.]

Since May 1935 all sera sent to the laboratory in Sierra Leone have been tested for the Weil-Felix reaction. The sera of 45 cases of fever of unknown origin were tested more than once and of these 5 gave reactions of 1/100 and above for *Proteus OX19* and *OX2*. Three of these cases were clinically and serologically definite cases of typhus; short clinical accounts are given of these 3 cases, no rash could be detected in any of them. In one case a titre of 1/3000 for *OX19* was reached and in another the highest titre was 1/6400; all were negative for *OXK*. The onset was abrupt and the fever lasted 10 to 14 days.

So far as the writers and the reviewer are aware these are the first cases of typhus to be reported as such, Weil-Felix reaction positive, in West Africa and it is hoped that medical officers in other areas will be on the outlook for further cases.

D. H.

FONTOURA DE SEQUEIRA (Luiz A.). Quelques considérations sur un cas de fièvre exanthématique de la Guinée Portugaise. [**Typhus Fever in Portuguese West Africa.**]—*Rev. Méd. et Hyg. Trop.* 1936. July–Aug. Vol. 28. No. 4. pp. 210–217. With 1 fig. & 1 chart.

The author while in bush country in Portuguese West Africa on trypanosome investigation contracted fever and gives an account of his case.

He refers at length to the Report of the Public Health Department of Mozambique published in the year 1908 in Lorenzo Marques in which Professor SANTANA describes a typhus-like fever. SANTANA records that the fever resulted from the bite of ticks, these bites gave rise to primary sores (ulcers with adenitis) and were followed some days later by fever, accompanied in some instances by a definite maculo-papular rash; the ticks collected from the cases were *Amblyomma* and *Rhipicephalus*. This work preceded by some years the work of NUTTALL and others. In the author's own case he notes that while in the bush he suffered from several small itchy papules but could find neither ticks nor mites on the skin. About a week after his return from the bush he developed fever and discovered an initial sore in the axilla with enlarged glands. The fever lasted 10 days and on the 5th day a maculo-papular rash was noted on the face. Headache and insomnia were the troublesome symptoms. As regards the vector in his case the author notes that a month or two after his illness he was again in the bush country and again felt the same itchy sores on his legs. On examination of these he found one or two larval mites and also obtained several similar mites from the grass. It is hoped to have these mites identified later. Ticks (*R. sanguineus*) were also numerous in the neighbourhood.

D. H.

PERGHER (G.). Recherches expérimentales sur l'épidémie du typhus exanthématique de l'Urundi. [**Investigation of the Virus of Exanthematic Typhus in Urundi.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. June 30. Vol. 16. No. 2. pp. 227–251. With 6 figs.

The virus investigated was isolated from cases of typhus fever and also from lice fed on these cases.

There is nothing new regarding the virus but the paper clearly demonstrates that the virus was an epidemic or historic virus and that the disease was conveyed by lice. One interesting point in regard to this epidemic was that a rash was only observed in less than 1 per cent. of the cases and even in these was only slight and evanescent. In 3 European cases the rash occurred in one only. In the laboratory investigations of the virus only guineapigs were used as white rats were not available, but the virus was sent to Belgium and was there inoculated into rats and produced only an inapparent infection. The virus was isolated, by inoculation of blood into guineapigs, from 6 cases but only 2 were fully investigated. Fever resulted in all guineapigs but true orchitis was not seen in any nor could *Rickettsia* be found in the tunica. Three strains of virus were obtained from lice: (a) lice from cases of fever, (b) lice from contacts, and (c) normal lice fed on cases. All three infected guineapigs; these viruses from lice were more virulent than the virus from the blood of cases.

Crossed immunity experiments were carried out and it was found that all the local strains protected against one another, human *v.* human, louse *v.* louse and louse *v.* human. Also there was cross immunity with the Urundi virus and a European murine typhus virus. It was also noted that this virus had a strong affinity for the nervous system of the experimental animals. The brain was infective early and contained more virus than the blood—further proof that the virus was a true typhus virus and not a murine virus. Some thousands of lice were collected from healthy natives of the locality where typhus had occurred 4 months previously and 2,000 were emulsified in batches of 500 and inoculated into guineapigs, but without any result. Rats and mice collected from the same area were also tested but no infection was noted. D. H.

HINMAN (E. Harold). **History of Typhus Fever in Louisiana.**—*Amer. Jl. Public Health*. 1936. Nov. Vol. 26. No. 11. pp. 1117-1124.

The author records the occurrence of epidemics of typhus fever in New Orleans from the year 1844 to 1860; the infection was introduced by immigrants from Europe especially from Ireland and by disbanded United States soldiers returning from Mexico and the disease was largely confined to these people and did not spread to the local inhabitants. During this period of 16 years there were nearly 3,000 deaths. The interesting point is that during the years 1864-1880 following the Civil War and the blockade of the city only 104 deaths from typhus were reported. Endemic typhus was not recognized in Louisiana till 1929 and since that time 46 cases have been diagnosed. These cases all occurred among people, natives of the State and who had been long resident there, and there was evidence that the cases were associated with rat prevalence. D. H.

ALMAZAN (L. Andreu). **Le typhus au Mexique de 1925 à 1935.** [**Typhus Fever in Mexico, 1925-1935.**]—*Bull. Office Internat. d'Hyg. Publique*. 1936. Nov. Vol. 28. No. 11. pp. 2138-2141. With 2 charts.

During the period under review typhus fever has increased in Mexico. In 1929 in the district under the test there were only 150

cases with 28 deaths reported, whereas in 1935 in 6 months there were 750 cases with 332 deaths. Numerous vaccinations were carried out in 1933-1935 with the Zinsser vaccine and contacts were given a dose of antityphus horse serum; but the numbers who could be treated in this manner were too few to have any effect on the incidence of the disease.

D. H.

VIOLLE (H.). Contribution à l'étude des virus du typhus murin. [**Contribution to the Study of Murine Typhus Virus.**]—*Bull. Acad. Méd.* 1936. July 23. 100th Year. 3rd Ser. Vol. 115. No. 28. pp. 143-146. With 2 figs.

A case of mild typhus fever which occurred in Marseilles is described. There were no dogs in the house of the patient but the place was overrun by rats. The blood from the case was inoculated into 2 rats and 2 guineapigs; both rats developed fever but there was only slight fever in the guineapigs. The virus was passaged in rats, emulsion of brain was inoculated intraperitoneally, the virulence was much enhanced by this method and high fever resulted both in rats and guineapigs with orchitis in the latter.

The author considers that this virus is similar to the virus of ship typhus at Toulon, *i.e.* an endemic typhus virus not *boutonneuse* virus.

D. H.

KEMP (Hardy A.). **Failure to establish the Virus of Endemic Typhus in Rats by feeding them Infected Guinea Pig Tissue.**—*Amer. Jl. Trop. Med.* 1936. July. Vol. 16. No. 4. pp. 479-480.

White rats were fed on tunica of infected guineapigs and were killed at intervals of 1 week, 10 days, 2 weeks, 3 weeks and 4 weeks thereafter. Two rats were killed at each period of time and emulsion of the brains inoculated into guineapigs. There was no fever in any of the guineapigs and none was immune when tested later.

D. H.

LE CHUITON (F.), BERGE (Ch.) & PENNANÉAC'H (J.). Action du vieillissement sur le virus du typhus murin (souche Toulonaise P. F. X.). Possibilité de la transmission de la maladie du rat à l'homme par la voie digestive. [**Effect of Ageing on the Virus of Murine Typhus. Transmission from Rat to Man by the Alimentary Route.**]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 835-839.

An emulsion of the brain of a guineapig infected with the murine typhus of Toulon was added to 2 cc. of the blood of the same animal. The mixture was kept in the dark for 10 days and was tested, by injection into rats and guineapigs, at intervals of 2 days, 4 days, 6 days and 10 days; some of the mixture was also given to other normal animals by the mouth.

The mixture was infective after 2 days; after 4 days there was some doubtful evidence of infection, *i.e.*, slight fever and immunity. At 10 days there was no sign of infection.

The authors suggest the possibility of infection of man by means of food soiled by the infective urine of rats, as the virus may remain infective for 3 or 4 days at least.

D. H.

BRUMPT (E.). Longue conservation de 28 mois du virus du typhus de São Paulo chez l'argasiné *Ornithodoros turicata*. Non transmission par la piqure de cet acarien. [**Conservation of the São Paulo Virus in *O. turicata*.**]—*Ann. Parasit. Humaine et Comparée*. 1936. Nov. 1. Vol. 14. No. 6. pp. 621–628.

——. Le virus de la fièvre pourprée des Montagnes Rocheuses peut se conserver plus de 600 jours dans le corps de l'*Ornithodoros turicata*, mais n'est pas transmis par la piqure de cet acarien. [**Conservation of Rocky Mountain Fever Virus in *O. turicata*.**]—*Ibid.* pp. 629–631.

Brumpt by means of a series of experiments carried out over a period of years has found that the virus of São Paulo typhus is viable in the soft tick *O. turicata* for a period of more than two years and that the virus of Rocky Mountain fever in the same tick is viable for a period of 620 days.

In view of the risks incurred (Professor Brumpt contracted the disease in the course of these experiments) in dealing with these dangerous viruses Brumpt recommends the method of conserving the virus in the tick as being less risky than constant reinoculation of guineapigs by means of heart blood injections. D. H.

FEJGIN (Bronislawa). Sur la persistance du virus du typhus exanthématique dans les poux. [**Persistence of Typhus Virus in Lice.**]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 37–39.

A dozen infected lice were received in August 1932 by the writer from Professor Weigl's laboratory at Lwow. As the virus was not required at the time the lice, in a glass tube inside a wooden box, were placed in the refrigerator at a temperature of $+4^{\circ}\text{C}$.

In November 1934 the dried lice and some of their excreta were removed from the tube and emulsified and injected into guineapigs, these became infected and the virus was passed. Rabbits sub-inoculated from the guineapigs were also infected and their sera gave a positive Weil-Felix reaction. The tissues of the guineapigs were proved to be sterile on ordinary media except that on one occasion a *Proteus X* bacillus was isolated.

Thus the virus had remained alive in the lice and excreta for at least 27 months. D. H.

RAGIOT (Ch.) & DELBOVE (P.). Trois cas de manifestations nerveuses au cours des fièvres typho-exanthématiques observées en Cochinchine. [**Nervous Symptoms in Exanthematic Typhus.**]—*Bull Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 839–844.

Three cases of typhus fever in which there was involvement of the cerebrospinal and the central nervous system are described.

In the first case, which proved fatal, there was paralysis of both lower limbs and paresis of the right arm. The Weil-Felix reaction was positive for *Proteus OX19* in 1/1000.

In the second case the patient was comatose on admission and remained so for several days. There was a positive Babinski sign and other reflexes were abolished; the Weil-Felix reaction was positive for *X19* 1/500.

In the third case there was paralysis of both upper and lower limbs and reflexes were abolished in this case also. D. H.

LEWIS (B. S.). **An Anomalous Case of Typhus.**—*Jl. Roy. Nav. Med. Serv.* 1936. Oct. Vol. 22. No. 4. pp. 345-346. With 1 chart.

A case of typhus seen in Hankow.

A marked symptom in this case was severe abdominal pain with vomiting, there was no rash at any time, the patient was mentally confused and had no recollection of his 14 days of fever. The Weil-Felix reaction was strongly positive.

D. H.

SEREFETTIN (Osman). Die verschiedenen Formen des Fleckfiebers in der Türkei. [**The Various Types of Typhus Fever in Turkey.**]—*Deut. Med. Woch.* 1936. Aug. 14. Vol. 62. No. 33. pp. 1334-1335.

The author has encountered three distinct types of typhus fever in Turkey: (a) sporadic cases of historic louse borne typhus; (b) a few cases of *boutonneuse* fever; (c) cases of endemic typhus carried by the rat flea, from rats which were found to be infected with the virus.

D. H.

BOUDIN (Georges) & RAMBERT (P.). Un nouveau cas de fièvre boutonneuse observé à Paris. [**Another Case of Boutonneuse Fever in Paris.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1936. Nov. 23. 52nd Year. 3rd Ser. No. 31. pp. 1497-1500.

Some 2 years ago a case of *boutonneuse* fever was described in Paris; in the present paper a second case is described. The patient, a small boy of 6 years of age, had only arrived in Paris from the south of France a week before he became ill, so that this case did not originate in Paris nor did the previous case.

There was a profuse rash of the true "button" character and a definite "tache noire" was detected above the right breast, the glands in the axilla were enlarged and small painful glands were also felt in the neck, part of a general micro-adenitis. Although there was no typhoid state, there was evidence of irritation of the meninges, i.e., violent headache, stiffness of the neck, Kernig's sign and pain and tenderness in the limbs. The Weil-Felix reaction was negative, the fever lasted 16 days and the primary sore disappeared in 10 days. The patient had been in close contact with tick infested dogs in his home in the country.

D. H.

AUGIER (Pierre) & DURANDY (Paul). Les manifestations nerveuses au cours de la fièvre boutonneuse méditerranéenne. [**Nervous Symptoms in Boutonneuse Fever.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1936. Nov. 30. 52nd Year. 3rd Ser. No. 32. pp. 1545-1553.

In 8 cases of *boutonneuse* fever observed by the authors in hospital in Nice, 7 showed definite involvement of the central nervous system, an encephalitis. The symptoms noted were violent headache, insomnia, pains in limbs, muscles and joints, rigidity especially of the upper limbs accompanied by contractions, exaggerated reflexes, and cramps in limbs (see paper by BOUDIN & RAMBERT above).

D. H.

PLAZY (L.). Les phlébites dans la fièvre boutonneuse. [**Phlebitis in Boutonneuse Fever.**—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. p. 703.

In 1933 the author published an account of a case of *boutonneuse* fever which was complicated by phlebitis in the left leg, this complication appeared on the 17th day of the disease. The author has never seen phlebitis in any of his cases of endemic typhus.

D. H.

LOEWENTHAL (L. J. A.). **A Note on Tick-Typhus in the Eastern Province of Uganda.**—*East African Med. Jl.* 1936. Aug. Vol. 13. No. 5. pp. 141–145. [10 refs.]

A vivid account of a personal experience.

The author's duty entailed walking through tick-infested grass, in the evening when removing ticks from the person the head of one remained in the skin of the groin. Four days later an ulcer developed at this site followed by lymphangitis and enlarged lymph glands, a typical "tache noire." On the 5th day after the appearance of the ulcer several rigors were experienced and the temperature reached 104° in the evening, on the following day a rash appeared on the neck, chest, back and on the palms and soles; this was an erythema with maculae, some of which had a petechial centre.

The spleen was enlarged, headache was severe and insomnia was marked during the 7 days that the fever lasted. A peculiar smell compared to a combination of the odour of hot oil and dirty clothes was noted. The pulse rate was never above 100, the fever ended by crisis on the 8th day. The Weil-Felix reaction tested with serum taken on the 8th day was negative.

Six months later a similar attack with fever, primary sore, etc., was again experienced by the author. A patient observed by the author developed fever 4 days after working on ground heavily infested with ticks, 2 days later pain was felt in the left axilla (enlarged glands) and a small ulcer (tache noire) was discovered in the scapular region. The fever was more severe than in the author's case and the termination was by lysis to normal on the 13th day.

D. H.

FEJGIN (B.). Sur le *Proteus X19* isolé du typhus exanthématique. [***Proteus X19* isolated from Cases of Exanthematic Typhus.**—*C. R. Soc. Biol.* 1936. Vol. 123. No. 27. pp. 257–259.

Forty-eight samples of blood were taken from typhus cases, the serum was drawn off and tested for the Weil-Felix reaction which was positive in all; the clot was then taken and cultured in broth and then on to Endo's medium; of the 48 samples only one yielded a culture of a typical *Proteus X19*. This bacillus was agglutinated by the sera of typhus cases and by specific *X19* rabbit serum at the same titre as the stock *OX19* and also gave the typical cultural reactions of a *Proteus* bacillus.

A similar strain of *Proteus X19* was isolated from infected lice.

D. H.

VARELA (Gerardo) & BARRERA (Abel). L'agglutination des *Proteus* X19 et K par les sérums de typhus endémique américain. [**Proteus Agglutination in Mexican Typhus Fever.**].—*Bull. Office Internat. d'Hyg. Publique*. 1936. Nov. Vol. 28. No. 11. pp. 2142–2145.

The sera of 50 cases of Mexican typhus were tested against *Proteus* OX19 and OXK. Only one of these sera agglutinated OXK, the remainder agglutinated OX19. D. H.

LILLIE (R. D.) & DYER (R. E.). **Brain Reaction in Guinea Pigs infected with Endemic Typhus, Epidemic (European) Typhus, and Rocky Mountain Spotted Fever, Eastern and Western Types.**—*Public Health Rep.* 1936. Sept. 18. Vol. 51. No. 38. pp. 1293–1307. With 3 charts. [22 refs.]

The main conclusions in this paper are as follows :—

(1) The character of the individual brain lesions is not noticeably different in endemic or epidemic typhus and in Eastern and Western Rocky Mountain spotted fever.

(2) In Rocky Mountain fever more lesions are found in the pons and medulla than are seen in typhus fever. To demonstrate the location of the lesions serial sections of the brain must be made and examined.

(3) The presence of a scrotal and testicular reaction in endemic typhus does not decrease the intensity of the brain reaction but rather the reverse.

(4) The greatest number of lesions in the brains of guineapigs are to be found on the 2nd, 3rd and 4th day of the 2nd week of typhus infection. D. H.

DANIELOPOLU' (D.), LUPU (N. G.) CRACIUN (E.) & PETRESCO (M.). Recherches anatomo-cliniques sur le typhus exantématique. 2-ème communication. L'appareil cardio-vasculaire dans le typhus exantématique. Clinique—Anatomo-pathologie—Thérapeutique. [**The Pathological Anatomy of Exanthematic Typhus.**].—*Bull. Acad. Méd. Roumanie*. Paris. 1936. Vol. 1. No. 3. pp. 420–445. With 7 figs. (2 coloured).

This paper is not suitable for summary and the text and plates should be consulted by those interested. D. H.

GIROUD (Paul). Variations quantitatives des rickettsies du typhus exantématique du cobaye aux lieux d'inoculation. Influence des hormones. [**Variations in Rickettsia Numbers according to Inoculum.**].—*C. R. Soc. Biol.* 1936. Vol. 123. No. 28. pp. 368–370.

The author found that if the intraperitoneal inoculum employed is testicular washings very numerous Rickettsia will be found and also Mooser cells, but if brain is employed as inoculum Rickettsia only appear in small numbers and soon disappear again. If testicular extracts are given to female guineapigs similar results are achieved.

D. H

OKAMOTO (Ryozo) & MASAYAMA (Suguru). Nachweis des Fleckfiebertvirus (R. Exanthematofebri) in Schnittpraeparaten aus den verschiedenen Organen der Ratten.—*Jl. Oriental Med.* 1936. Sept. Vol. 25. No. 3. [In Japanese pp. 619–623. With 12 figs. on 2 plates. German summary pp. 59–60.]

MAITRA (G. C.) & GUPTA (P. N. Sen). A Note on Cases of Typhus Fever in Burma and their Distribution.—*Indian Med. Gaz.* 1936. Oct. Vol. 71. No. 10. pp. 572–574. [11 refs.]

Since 1934 all sera sent to the laboratory have been tested for the Weil-Felix reaction, also the following information has been asked for in each case :—

(1) Any history of insect bite; (2) presence of rash; and (3) presence of adenitis.

One hundred cases have been detected, these cases are not confined to any particular area but are spread all over Burma.

Results of Weil-Felix Reaction.

Year				<i>Proteus OX19</i>	<i>Proteus OXK</i>
1934	...	...	...	12	5
1935	...	...	...	19	25
1936	...	...	...	35	10
				—	—
				66	40
				—	—

D. H.

FEJGIN (Bronislawa). Sur le pouvoir hémolytique des filtrats des cultures de HX₁₉ et de la suspension des *Rickettsia prowazeki*. [On the Haemolytic Properties of Filtrates of Cultures of *Proteus X19* and of Suspensions of *R. prowazeki*.]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 40–42.

Filtered cultures of *Proteus X19* were shown to possess considerable haemolytic power, the minimal haemolytic dose was estimated at 0.001. An emulsion of the gut of infected lice was filtered and proved also to be haemolytic, 0.01 to 0.005 was the minimal dose; there was no haemolysin in the filtered emulsion of normal lice.

Anti-*X19* sera neutralized the haemolysin of the rickettsial emulsion and so also did the serum of typhus convalescents.

D. H.

CASTANEDA (M. Ruiz). Studies on the Mechanism of Immunity in Typhus Fever. Complement-Fixation in Typhus Fever.—*Jl. Immunology.* 1936. Oct. Vol. 31. No. 4. pp. 285–291. [17 refs.]

The results of the author's experiments tabulated in this paper show clearly that typhus immune serum contains complement binding antibodies for *R. prowazeki* but not for *Proteus*. On the other hand the sera from rabbits immunized against *Proteus X19* fix complement in the presence of *R. prowazeki* as well as with *Proteus*. It is suggested that the complement fixation test might be usefully employed in the diagnosis of typhus.

D. H.

CASTANEDA (M. Ruiz). **Studies on the Mechanism of Immunity in Typhus Fever. I. *Rickettsia prowazeki* in the Different Stages of the Typhus Lesion. II. Allergic and Toxic Reactions produced with *Rickettsia prowazeki*.**—*Jl. Experim. Med.* 1936. Nov. 1. Vol. 64. No. 5. pp. 689-699. With 8 figs. on 3 plates; pp. 701-715.

The washings from the peritoneum of rats infected with typhus virus were injected intradermally into guineapigs and the resulting lesions were examined.

A local inflammatory lesion was produced and in 72 hours *Rickettsia* could be found in the smears from these local sores; at first the organisms were in the polynuclear cells and also in cells in the capillary walls (Mooser cells), later they were also seen in the large macrophages along with ingested polynuclear cells; later on this phagocytosis results in the disappearance of *Rickettsia* from the lesion. Swelling of the lining of the small blood vessels was also noted. *D. H.*

CASTANEDA (M. Ruiz). **Studies on the Mechanism of Immunity in Typhus Fever. III. Demonstration of Opsonins for *Rickettsia prowazeki* in Typhus-Immune Serum.**—*Jl. Immunology.* 1936. Sept. Vol. 31. No. 3. pp. 227-237. With 2 figs. on 1 plate.

A demonstration of phagocytosis of the *Rickettsia* of Mexican typhus.

The materials employed were (1) defibrinated blood of normal guineapigs; (2) typhus immune serum from patients and convalescents or anti-typhus horse serum, also anti-*X19* serum from rabbits; (3) suspension of *Rickettsia* from the peritoneal fluid of infected and irradiated rats.

Equal volumes of immune serum and *Rickettsia* emulsion are mixed and incubated for one hour at 37°C.; 0.1 cc. of the above is then added to 0.4 cc. of the defibrinated blood and incubated for one hour, smears are then made and stained and 100 cells counted. In controls with normal serum no phagocytosis was seen but with the serum of immune persons and animals the leucocytes were packed with *Rickettsia*.

Guineapigs were inoculated with infected tunica washings and bled daily for 12 days after inoculation, phagocytosis of *Rickettsia* was noted after 96 hours and was marked after 5 days. Opsonins were noted in the blood of typhus patients 2-6 years after the fever. A volunteer was inoculated with *Rickettsial* emulsion and opsonins appeared in his blood. It is interesting to note that opsonins could not be demonstrated in the sera of rabbits inoculated with *Proteus X* bacilli. *D. H.*

ZINSSER (Hans) & MACCHIAVELLO (Attilio). **Further Studies on Typhus Fever. On Homologous Active Immunization against the European Strain of Typhus Fever.**—*Jl. Experim. Med.* 1936. Nov. 1. Vol. 64. No. 5. pp. 673-687. With 4 charts. [10 refs.]

It is necessary to obtain large numbers of *Rickettsia* for the production of vaccines. Irradiation of infected rats produces large numbers in the case of the rat virus but is of little use in the case of the virus of epidemic or European typhus. Weigl's method of preparing vaccine from infected lice is not suitable for the mass production of

vaccine. The authors suggest that it may be possible to obtain sufficient material for vaccine production by means of tissue culture of the European epidemic virus. Tunica scrapings from infected guineapigs are employed and serum and Tyrode or ascitic fluid is inoculated and incubated, the vaccine is later formolized. The employment of sero-vaccination on the lines of yellow fever immunization is also suggested, the virus employed being virulent defibrinated blood of guineapigs mixed with immune serum, or tissue cultures of the virus with immune serum.

D. H.

ZINSSER (Hans) & MACCHIAVELLO (Attilio). **Enlarged Tissue Cultures of European Typhus Rickettsiae for Vaccine Production.**—*Proc. Soc. Experim. Biol. & Med.* 1936. Oct. Vol. 35. No. 1. pp. 84–87. With 1 fig.

In order to obtain larger numbers of Rickettsia of European typhus virus in tissue culture for purposes of vaccine production the authors are employing large Erlenmeyer flasks of 250 cc. capacity; about 20 cc. of the culture fluid is placed in these flasks giving a ratio of fluid to air space of about 1 to 12, which is the optimum ratio. The fluid employed is, 1 part horse serum to 4 parts Tyrode solution and the greatest number of Rickettsia are found on the 8th or 9th day of incubation. The cultures are treated with 0.1 per cent. formaline to make the vaccine.

D. H.

SIGON (M.) & MIGONE (L.). Sulla febbre esantematica del litorale mediterraneo. (Contributo sperimentale.) [**Experimental Study on Mediterranean Typhus.**]—*Boll. Istituto Sieroterap. Milanese.* 1936. Oct. Vol. 15. No. 10. pp. 633–640. With 6 charts & 12 figs. on 2 plates. [47 refs.] French summary.

The author injected two guineapigs with the blood of a patient suffering from *boutonneuse* fever. The peritoneal fluid and emulsions of the organs of these two were inoculated into 11 more guineapigs in succession. Five to six days after the inoculation those of the three first passages showed a moderate rise of temperature and 4 of eight died in 1–7 days. In the fourth passage (3 animals employed) one died, the fifth passage resulted in no clinical signs of the virus. The animals which succumbed were examined and in all there was marked visceral congestion with small haemorrhages (two showed ecchymoses of the abdominal skin). Microscopically, the vessel walls of most of the organs showed hyaline change, vacuolization, infiltration with small round cells and fibroblasts, and scattered haemorrhages. Perivascular infiltration in the brain was rare.

H. H. S.

BLANC (Georges). La vaccination contre le typhus exanthématique au Maroc. [**Prophylactic Inoculation against Typhus in Morocco.**]—*Bruxelles-Méd.* 1936. Nov. 22. Vol. 17. No. 4. pp. 116–120.

This lecture is a résumé of the work of the author on prophylactic inoculation in typhus with a living virus.

The virus is that of a mild type of murine typhus in Casablanca and emulsions prepared from the organs of infected guineapigs are mixed with ox bile and after 15 minutes contact 1 cc. of the diluted mixture is inoculated. The bile does not destroy the virus but modifies

it so that no fever is caused in the inoculated but immunity both to the homologous virus and to the virus of epidemic typhus is produced.

D. H.

GIROUD (Paul). Immunisation contre le typhus à l'aide de cultures desséchées et enrobées du virus typhique murin. [**Immunization against Typhus by means of Murine Virus.**—*C. R. Soc. Biol.* 1936. Vol. 122. No. 24. pp. 1071–1072.]

Cultures of Tunis rat typhus virus No. 1 were prepared by the method of Nigg and Landsteiner. These cultures were dried and enclosed in yolk of egg.

Ten guineapigs were injected intradermally 3 times at intervals of 10 days with dried culture only, and when tested later with virulent virus all were immune.

Ten guineapigs were given 2 doses at 10-day intervals of dried culture enveloped in yolk of egg; when tested later all were immune with one exception.

Ten guineapigs were given one dose only of emulsion of culture in yolk of egg, only one was immunized.

From the above it was decided that at least 2 doses of the vaccine are necessary.

Four monkeys were given 2 doses of culture in yolk of egg at an interval of 8 days; all were proved to be immune.

D. H.

TENNENT (J. H.). **Atebrin in Tropical Typhus.**—*East African Med. J.* 1936. Nov. Vol. 13. No. 8. p. 254.

A case of fever was treated with atebrin, 1 tablet 3 times a day, as malaria was suspected. The patient developed a typhus rash and the Weil-Felix reaction was positive; the fever ran its usual course but the patient had no concomitant discomforts such as headache or photophobia.

Half a dozen cases of typhus have since been treated with atebrin and in all six the same gratifying absence of complication has been noted. It is suggested that atebrin should be given a trial in typhus fevers elsewhere, as possibly these cases were all mild cases.

D. H.

PUBLIC HEALTH REPORTS. 1936. Dec. 18. Vol. 51. No. 51. p. 1773.—**Spotted Fever, Eastern Type, on Vessel arriving at Los Angeles Harbor.**

Two cases of typhus were landed at San Pedro from a ship which had come from South American ports; these cases were diagnosed by the Port Health authorities as Rocky Mountain spotted fever.

D. H.

GOLD (Herman) & GOODMAN (William). **Rocky Mountain Spotted Fever: Report of Two Cases.**—*Trans. College of Physicians of Philadelphia.* 1936. 4th Ser. Vol. 4. No. 1. pp. 50–51.

An account of 2 cases of Rocky Mountain spotted fever contracted in Pennsylvania, both the patients recovered. The Weil-Felix reaction was positive in each case and ticks were found on both.

D. H.

DENGUE AND SANDFLY FEVER.

GRIFFITTS (T. H. D.) & HANSON (Henry). **Significance of an Epidemic of Dengue.**—*Jl. Amer. Med. Assoc.* 1936. Oct. 3. Vol. 107. No. 14. pp. 1107-1109.

In 1934, dengue fever appeared in Miami and spread rapidly throughout Florida, in 2 months the disease was reported in 70 municipalities. The authors ask "If dengue why not yellow fever?" There are no people immune to yellow fever in Florida and there are plenty of *Aedes* mosquitoes.

In Tampa in 8 weeks in 1934 over 1 million containers were found and larvae were found in 2 per cent. of these; in Miami 68 per cent. of the containers held larvae. As the authors say, *Aedes aegypti* production is not under control and never has been. The absence of yellow fever up to the present is due to:—

- (1) The vigilance of the Public Health authorities.
- (2) The absence of yellow fever from South American ports.

It is emphasized that mosquitoes may be carried by aeroplane and by motor.

D. Harvey

LORANDO (N.). L'épidémie de Drapetsona et de Kokinia est une fièvre dengue. [**The Drapetsona and Kokinia Outbreak.**]—*Rev. Méd. et Hyg. Trop.* 1936. Sept.-Oct. Vol. 28. No. 5. pp. 265-273.

Apparently there has been difference of opinion as regards this epidemic, whether it was sandfly fever or dengue. The author emphasizes the differences between these two fevers, both from the clinical and epidemiological aspects.

The first cases appeared towards the end of August when sandflies were still present but in diminishing numbers, and these insects could not be found in September and October; during these months many cases of fever occurred and *Aedes* mosquitoes were abundant. If the cases had been sandfly fever they should have ceased in September. As regards the clinical course of the disease, of 28 cases, carefully observed, in 25 the fever exceeded 3 days and temperature charts showed the typical V or saddle-back curve. The author has never seen a rash in sandfly fever, but in many of the cases in the present series there was a very definite rash. The author is convinced that there was a definite outbreak of dengue (see paper by ALIVISATOS below).

D. H.

ALIVISATOS (G. P.), with the collaboration of A. PAGONIS & T. TRIANTAPHYLLOU. Sur l'épidémie de fièvre de trois jours de 1935 à Athènes et ses environs. [**The Outbreak of Three-day Fever at Athens in 1935.**]—*Bull. Office Internat. d'Hyg. Publique.* 1936. Nov. Vol. 28. No. 11. pp. 2146-2166. With 1 folding plan.

In a paper by LORANDO (above) it is contended that the outbreak of fever in Greece in 1935 was dengue. In the paper now summarized Alivisatos and others consider that all the cases were sandfly fever. The authors made a very careful epidemiological survey of the cases and the houses and they discovered that in the houses where cases were occurring both sandflies and *Aedes* in equal numbers could be

found until the second week of November. They agree that this is unusual (sandflies as a rule are seldom found after the end of September), but the summer of 1935 was unusually warm and the warm period lasted up till November, when a sharp cold spell occurred and the sandflies disappeared; on the other hand *Aedes* could still be found in large numbers through November and December 1935, and January of 1936. The cases of fever, however, ceased in November within 8 days of the disappearance of the sandflies, although *Aedes* persisted throughout the winter. The conclusions of the report are that the epidemic of fever in Athens and the suburbs from May to November 1935 was sandfly fever. Only 7 per cent. of the cases observed by the authors were of the severe or major variety, a "dengue like" erythematous rash was noted in these cases.

In one house, at one and the same time, mild cases with and without exanthem and severe cases with and without rash were met with. It was also found that there was no difference clinically between cases in people who had had dengue in 1928 and those who had not had dengue previously. In children under 7 years of age who had been born since the 1928 epidemic the disease was mild and typical of sandfly fever, a rash was only noted in 7 per cent. of these cases, the same rate as in adults. As the epidemic developed so the cases became more severe and the fever lasted longer.

The spread of the epidemic was that of sandfly fever, slow and gradual and not sudden and explosive all over the city and suburbs as in the dengue epidemic of 1928; the range of flight of the sandfly is much more limited than that of the mosquito.

Aedes is distributed over the old town and the suburbs, whereas sandflies are much more numerous in the suburbs than in the centre of the city; the distribution of the cases was in accordance with this observation.

D. H.

SHORTT (H. E.), POOLE (L. T.) & STEPHENS (E. D.). **Note on Some Experiments with Sandfly Fever Blood and Serum.**—*Jl. Roy. Army Med. Corps.* 1936. Oct. Vol. 67. No. 4. pp. 246-250. With 2 charts.

Volunteers who had been infected with sandfly fever the previous year were retested.

Three bloods from cases of sandfly fever in Peshawar were received in Kasauli and each sample was divided into 2. Half was injected into one of the volunteers in whom sandfly fever had been experimentally induced the previous year (old volunteer), and half into a volunteer giving no previous history of sandfly fever (new volunteer).

Results.

		Typical attack	Modified attack	Failed
Old volunteers	...	0	2	1
New volunteers	...	2	0	1

The results appear to show evidence of a degree of immunity 1 year after an attack of fever.

Serum was obtained from a case in Peshawar ; both whole serum and dried serum proved to be infective.

Immunization on the same lines as in yellow fever is suggested.

D. H.

THEODOR (Oskar). **On the Relation of *Phlebotomus papatasi* to the Temperature and Humidity of the Environment.**—*Bull. Entom. Res.* 1936. Dec. Vol. 27. Pt. 4. pp. 653–671. With 16 figs. [10 refs.]

The author has carried out experiments, the purpose of which was to discover the climatic factors which affect the life of *Phlebotomus papatasi*. The experiments define the thermal limits, the effect of temperature and humidity on the length of life of larva, pupa and adult, and similar matters.

It is found that the upper temperature limit differs slightly according to the sex and the nutritional state of the adult, but that in all cases the flies are killed by one hour at 43°C. (109°F.) ; the upper limit for larvae is the same. At first sight the figure seems remarkably low compared with the daily maxima which occur in summer in certain places such as Baghdad, in which the insect is common at that season. Doubtless, however, the insect avoids the extreme of heat and dryness by taking refuge in cracks in walls or in soil. At temperatures which are favourable, and which might be expected to occur in places where the larvae are found, it was observed that the larvae died in a few hours at all humidities unless the air was saturated with water, and actual droplets of water were present. The pupa also can only continue to exist in contact with moist surfaces. This is most unexpected (though natural enough in a Nematoceran, members of that group being so closely associated with aquatic life). Here, again, we may assume that the existence of the early stages in nature in the middle of a hot, dry, Mediterranean summer is possible, because they live deep enough in the soil to be in actual contact with running water. The adults, it appears, are quite unlike the larvae and pupae in relation to humidity, for at each of the four temperatures tested they showed unexpected powers of enduring humidities that are rather low ; for instance, at 23°C. (73°F.) flies which had fed once survived 9 days (mean) in saturated air, and as much as 7·5 at a humidity of 60 per cent.

In the course of his experiments Theodor made some interesting observations on the physiology of hibernation in the larva : relatively large quantities of ether-soluble material is accumulated at or just before hibernation, as indeed it is in many other insects. He also gives some precise facts about the weight of blood taken at a single meal. These facts may be valuable for many purposes, particularly if it is necessary to make a quantitative study of the number of flagellates which a sandfly could take up.

It is perhaps interesting that much of the work was done in London, modern methods of rearing the insect, largely developed by Theodor, making it possible to breed insects for experiments in a place where the necessary physiological apparatus was available.

The experiments must have been laborious to carry out, and difficult in view of the minuteness of the insect, but they lead one to a new conception of its life in nature.

P. A. Buxton.

TROPICAL OPHTHALMOLOGY.

A REVIEW OF RECENT ARTICLES. XXVII.*

Conjunctiva.—DIMITRY¹ has endeavoured to refute the theory that dust is the chief factor in the aetiology of pterygium. He asserts that the disease is more common in the verdure-clad State of Louisiana than in States where dust is very prevalent. Warmth, however, often seems favourable to the growth. (Desiccating and dust-laden winds are probably the chief factor.)

SANYAL² has described a form of kerato-conjunctivitis which is likely to be confused with trachoma and other conjunctival inflammations. The disease is characterized by the presence of yellowish points of degeneration in the membrane; these are often surrounded by small granules. In the majority of cases the preauricular gland is enlarged, and young persons may sometimes experience a slight rise of temperature. Vascularization and ulceration of the cornea may occur in acute or subacute cases. The keratitis may assume a variety of forms, and vascularization may closely resemble trachomatous pannus. Pathological examination showed intracellular and extracellular groups of small cocci which are assumed to be the cause of the disease.

Trachoma.—KIEWE³ has published the result of experiments which confirm VON SZILY's observations regarding the development of lymph follicles in the vitreous and ocular tissues of rabbits which have been subjected to the intraocular injection of trachomatous material. The injection is made into the anterior chamber after a paracentesis has been performed. As regards the specific nature of the reaction one positive result occurred after inoculation with material from a case of spring catarrh.

BUSACCA⁴ remarks that the knowledge of European ophthalmologists regarding trachoma in Brazil is a little vague. He believes that the disease was present in the country long before the first influx of Italians and other immigrants in the second half of the last century—possibly it was introduced by the Conquistadores. About 14 per cent. of nearly 3,000 eye patients were found to be trachomatous, the working classes being chiefly affected. On the whole, the disease is benign, and serious complications are uncommon. SÉDAN⁵, after reviewing the reasons given by various authors as to why one eye should remain

* For the twenty-sixth of this series see Vol. 33, pp. 902-905.

¹ DIMITRY (Theodore J.). The Dust Factor in the Production of Pterygium.—*Amer. Jl. Ophthalm.* 1937. Jan Vol. 20 No. 1. pp. 40-45. With 2 maps.

² SANYAL (Saradindu). Keratoconjunctivitis with Adenitis in Calcutta.—*Amer. Jl. Ophthalm.* 1936. Nov. Vol. 19. No 11. pp. 982-989. With 5 figs.

³ KIEWE (Paul). Results of Intra-Ocular Inoculation of Trachoma. (On the Question of the "Follicle-Building Agent" of von Szily).—*Brit. Jl. Ophthalm.* 1936. Oct. Vol. 20. No. 10. pp. 576-585. With 6 figs.

⁴ BUSACCA (Archimede). Impressions et données statistiques sur le trachome dans l'état de S. Paulo.—*Rev. Internat. du Trachome.* 1936. Oct. Vol. 13. No. 4. pp. 161-171. With 1 graph.

⁵ SÉDAN (Jean). Les facteurs lacrymaux et traumatiques dans le trachome unilatéral.—*Rev. Internat. du Trachome.* 1936. Oct. Vol. 13. No. 4. pp. 184-193. [16 refs.]

healthy in unilateral trachoma, states that he has observed an abnormality of the lachrymal passages in the affected eyes of many such patients. He has recorded three cases in which the disease followed a mild traumatic kerato-conjunctivitis, whilst the uninjured eye remained healthy. [It must be kept in mind that diagnosis is particularly difficult when only one eye is attacked by trachoma.] MIHAIL⁶ has investigated the differential leucocyte count in 41 trachoma patients and has found a tendency to a slight increase in the number of mononuclears; the increase in the lymphocytes was even less noticeable.

BENGTON (Ida A.) and ROLUFS⁷ consider that the inclusion body plays a part in the aetiology of the disease and probably originates from a rod-shaped micro-organism. This rod-shaped organism passes through a resistant phase—an "elementary-body" stage, and the blue-staining matrix of the inclusion body represents the remains of the rod forms. "The initial bodies" of Lindner probably represent the rod form of the organism after it has been acted upon by the lytic substances of the conjunctiva or of the epithelial cells. THYGESON⁸ in a review of the aetiology of trachoma concludes (1) that it is a specific communicable disease; (2) it is not caused by a specific bacterium or by repeated secondary infections; (3) the agent belongs to the group of filterable viruses and is likely to be identical with the elementary body of Prowazek and Halberstaedter. LENZEN & GRADLE⁹ report their experiences of over 1,100 cases of trachoma. The majority were treated by scrubbing with chaulmoogra oil, and by the use at home or in hospital of 1-5,000 oxycyanide of mercury lotion.

Cornea.—MAURY¹⁰ has reported the pathological examination of an eye which was subject to nodular dystrophy of the cornea. The appearances found suggest that the primary lesion is a hyalin-lipoid degeneration of localized portions of the corneal lamellae. WRIGHT¹¹ has described a degenerative condition of the cornea which he observed fairly often in Southern India. Irregular yellowish nodules project from the corneal surface; these are covered by epithelium and invade the *substantia propria*; they appear to contain an amber-coloured, oily fluid. Yellow, necrotic matter may occupy the intervals between the globules. The tissue exhibits a bluish haze, but gives an impression of transparency; slit-lamp examination of this area shows tiny refractile points lying deep to Bowman's membrane; these possibly represent the initial stages of the degeneration. The tissue in the more degenerated

⁶ MIHAIL (Al. C.). Recherches sur la formule leucocytaire chez les trachomateux. —*Rev. Internat. du Trachome*. 1936. Oct. Vol. 13. No. 4. pp. 193-199. [13 refs.]

⁷ BENGTON (Ida A.) & ROLUFS (L. S.). Observations on the Epithelial-Cell Inclusions of Early Uncomplicated Trachoma.—*Amer. Jl. Ophthalm.* 1936. Mar. Vol. 19. No. 3. pp. 229-238. With 10 figs. [12 refs.]

⁸ THYGESON (Phillips). An Analysis of Recent Studies on the Etiology of Trachoma.—*Amer. Jl. Ophthalm.* 1936. Aug. Vol. 19. No. 8. pp. 649-653. [37 refs.]

⁹ LENZEN (A. F.) & GRADLE (H. S.). The Treatment of Trachoma.—*Amer. Jl. Ophthalm.* 1936. Aug. Vol. 19. No. 8. pp. 665-668.

¹⁰ MAURY (Franklin H.). Pathology of Lattice and Nodular Dystrophy of the Cornea.—*Amer. Jl. Ophthalm.* 1936. Oct. Vol. 19. No. 10. pp. 866-872. With 4 figs. [13 refs.]

¹¹ WRIGHT (R. E.). Interstitial Degeneration of the Cornea.—*Amer. Jl. Ophthalm.* 1936. May. Vol. 19. No. 5. pp. 413-417. With 2 figs.

areas is very friable. The cornea is anaesthetic. The disease primarily affects males over the age of 30.

Cataract.—SPAETH¹² has reported the rapid development of bilateral cataract in a woman aged 37 who had dosed herself with dinitrophenol in order to reduce her weight. General symptoms included mental apathy and instability, with a fall in blood calcium and clinical signs of tetany. The cataracts were extracted and parathyroid medication remedied her general symptoms.

Two somewhat similar cases are reported by VEASEY.¹³ Rapid lens degeneration appears to be characteristic of the poisoning, but the changes may be delayed.

WHALMAN¹⁴ has tabulated 27 cases of the same condition. He remarks that the anterior layer of the lens capsule becomes spotty, dry and lustreless, and fine, gray, cloudy opacities appear beneath it. Irregular opacities appear in the deeper layers of the cortex. Dark spaces, resembling fluid clefts, appear in the lines of lens suture. Swelling is a marked feature, and acute glaucoma supervened in two patients of the series. He ascribes the lens changes to a hydrolysis following damage to the capsular cells.

Leprosy.—KING¹⁵ describes the ocular complications he has met with in the leprotic patients under his care at Chelmsford, where some 14 patients are inmates. One of the most characteristic changes in the eye is the development of a round circumscribed infiltration in the tissue at the *limbus*; this is somewhat gelatinous in appearance and is usually situated in the upper temporal quadrant. It tends to spread round the cornea and produces a loss of definition of the *limbus*. The corneal opacity becomes superficially vascularized, leading to leprotic pannus. Another distinctive form of keratitis is the appearance of greyish spots in the *substantia propria*; the whole thickness of the *substantia* is involved in the neighbourhood of the *limbus*, but the inflammation tends to become more superficial as it approaches the centre of the cornea. In other cases a deep infiltration may be found spreading from the periphery; this occurs as a sequel to leprotic cyclitis. Corneal anaesthesia is almost the rule in all patients. Leprotic nodules in the iris are uncommon, but an insidious iridocyclitis often occurs. A number of greyish, discrete spots are seen in the iris, and atrophy and depigmentation of the stroma may be found. Subconjunctival medication is disappointing, and the most hopeful surgical procedure is excision of the episcleral nodule at an early stage. Exposure keratitis is treated by tarsorrhaphy. The author remarks that the eyes in leprosy tolerate surgical interference extremely well.

Onchocerciasis is attracting increasing attention as a cause of blindness in tropical countries. STRONG¹⁶ has described his obser-

¹² SPAETH (Edmund B.). Dinitrophenol Cataracts with Signs of Tetany.—*Amer. Jl. Ophthalm.* 1936. Apr. Vol. 19. No. 4. pp. 320–323. With 1 fig.

¹³ VEASEY (Clarence A.). Report of Two Cases of Cataract following the Use of Dinitrophenol.—*Amer. Jl. Ophthalm.* 1936. Apr. Vol. 19. No. 4. pp. 332–334.

¹⁴ WHALMAN (Harold F.). Dinitrophenol Cataract.—*Amer. Jl. Ophthalm.* 1936. Oct. Vol. 19. No. 10. pp. 885–888.

¹⁵ KING (E. F.). The Eye in Leprosy.—*Brit. Jl. Ophthalm.* 1936. Oct. Vol. 20. No. 10. pp. 561–569. With 5 figs. [31 refs.]

¹⁶ STRONG (R. P.). Onchocerciasis in Central America and Africa.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. Vol. 30. No. 5. pp. 487–499.

vations on the disease as it occurs in Central Africa. Extensive infection is found amongst the pigmies and amongst the Basonge tribe. Those cases in which the nodules are located on the head or shoulders seem specially likely to suffer from ocular complications. Microfilariae are found in the greatest number in the skin in the vicinity of the tumours, and are more numerous in the ocular conjunctiva when the nodules are situated in the upper portion of the body. *S. damnosum* is principally concerned in the transmission of the disease, but *S. neavei* is also concerned. The keratitis which is associated with the disease is due to invasions of the *substantia* by the microfilariae.

The tenth annual report of the Giza Memorial Ophthalmic Laboratory¹⁷ for the year 1935 contains the usual interesting account of the pathological activities of the Institution and records of several rare forms of eye disease. The most important item is the contribution by R. P. WILSON on the various forms of conjunctivitis found amongst children in Egypt and the Near East. A striking feature is the almost complete absence of *ophthalmia neonatorum* in the country. The principal causes of infectious ophthalmia in Egypt are the gonococcus, Koch-Weekes bacillus and Morax-Axenfeld diplobacillus. Morax-Axenfeld infections, though common, are unimportant, but it is estimated that from 65 to 70 per cent. of blindness met with is due to the gonococcus. The infection has not a venereal origin, but is carried from eye to eye. Flies thrive best at a temperature of 31°C, and die off at 35°C. There are two main-fly-breeding seasons in Egypt: (1) March to May, and (2) in October, at which times climatic conditions favour the insects. The incidence of Koch-Weekes ophthalmias rises sharply in April when the temperature is 27° to 28°C. A fall occurs in May and June as the weather grows hotter, but a secondary rise occurs in the autumn during the second fly-breeding season. Very little gonococcal ophthalmia is seen during the winter months, and the epidemic begins during June, reaching its maximum in October with a slight check during August. The organism does not withstand drying well and its growth is favoured by high relative humidity. There is no doubt that the acute ophthalmias are intimately connected with trachoma, and the onset of this disease is often first noticed after an attack of acute ophthalmia. Where there is much ophthalmia there will be much trachoma, provided that trachoma is endemic. Acute infections render the conjunctiva more vulnerable and also provide a greater quantity of infective discharge. "There is absolutely no doubt, however, that neither a chronic Koch-Weekes conjunctivitis nor a gonococcal conjunctivitis can give rise *per se* to trachoma whether in the presence of adenoidism or any other diathesis."

The *Bulletin of the Ophthalmological Society of Egypt*¹⁸ for the year 1936 is mostly occupied by a symposium on trachoma under the presidency of Dr. MOHAMMED ABBAS EL BAKLY. In discussing the histopathology of the disease WILSON remarks that in its early stage the trachoma follicle is practically indistinguishable from the follicle

¹⁷ EGYPT: Ministry of Public Health. Tenth Annual Report of the Giza Memorial Ophthalmic Laboratory, Cairo, 1935 [WILSON (Rowland P.), Director].—136 pp. With 7 plates (5 coloured), 42 figs. & 4 graphs. 1936. Cairo. [25 P.T.]

¹⁸ BULLETIN OF THE OPHTHALMOLOGICAL SOCIETY OF EGYPT. 1936. Vol. 29. Session 33. pp. xxviii + 220. With numerous illustrations.

of follicular conjunctivitis. He regards the corneal changes as being due to direct contact infection from the lid and not to an extension by way of the bulbar conjunctiva; he expresses disagreement with MACCALLAN's statement that the so called "bleb-like excrescences" are due to a blockage of the ducts of the Meibomian glands. MEYERHOF reviews the history of treatment in ancient times, and it is interesting to note the reliance placed upon rubbing and the use of preparations of copper; Divine aid, too, was frequently invoked. FARID MASOUD, ATTIAH and EL TOVGY refer to the value of attending to the general constitutional condition of the patient.

H. Kirkpatrick.

MISCELLANEOUS.

- i. GIEMSA (G.) & NAUCK (E. G.). Rasse und Gesundheitserhaltung sowie Siedlungsfragen in den warmen Ländern. [**Race, Health Preservation and Colonization in Warm Countries.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Jan. Vol. 41. No. 1. pp. 9–21.]
- ii. WERNER (Heinrich). Ueber Rasse und Gesunderhaltung sowie Siedlungsfragen in warmen Ländern.—*Ibid.* pp. 22–29. [17 refs.]
- iii. OLPP (G.). Rasse und Tropenkrankheiten. [**Race and Tropical Disease.**—*Ibid.* pp. 35–41.]
- iv. FISCHER (Otto). Ueber den Gesundheitszustand aus den warmen Ländern kommender Europäerinder (Beobachtungen aus dem Tübinger Tropen-Genesungsheim). [**Health of European Children coming from Hot Countries : from the Tübingen Convalescent Home.**—*Ibid.* pp. 41–50. With 7 figs.]
- v. SEIFFERT (Gustav). Bedeutung und Organisation ländlichen Gesundheitsdienstes unter tropischen und subtropischen Verhältnissen. [**Importance and Organization of Rural Health Services in the Tropics and Subtropics.**—*Ibid.* pp. 50–72.]

i. This paper concerns chiefly the results of German colonization of Espirito Santo, Brazil, on the margin of the tropic zone.

This German settlement began in 1840, was reinforced in 1857 and again in 1873; additions practically ceased after 1880, when there were about 3,000 persons. In 1912 the German population was estimated to be 17,000–18,000 (WAGEMANN) and by 1935 it had reached 25,000 in a total population of 587,000. There has been no mixture with the indigenes.

The authors visited the colony and here report their observations. From an examination of the church records and other sources they calculate the figure of 30,000 for the present German population. Figures of births and deaths are given and of infant mortality, with comparative rates for France and Germany; birth and death rates in 1912 were 48.5 and 7.8 and in 1926–35, 46.1 and 8.7. It is clear, write the authors, that the conditions for acclimatization in Espirito Santo are fully met.

They consider the incidence of disease. Epidemics of yellow fever occur on the coast but affect the highlands little. Malaria is surprisingly scarce. Examination of 316 school children from four districts did not reveal a single infected child (spleen or parasites). There are few mosquitoes in the houses and nets are not used. Amoebic dysentery is rarer than in other tropical regions, a rarity attributed to the fact that raw vegetables are little used and human excreta are not employed as manure; it is stated that in S. Paulo where the Japanese raise salads, the infection has spread. The lack of protection of water supplies, however, is a danger. Helminth infestations, especially hookworm, are common.

In 1860, TSCHUDI, who travelled in Espirito Santo, reported on a disease called "Opilação," which he attributed to a faulty diet and especially the use of manioc. This was hookworm disease; the presence of hookworms in the bowel is almost universal in the absence of latrines and with the habit of going barefoot. The percentage in lowland children was 90.9 and in the highlands 88.7. High eosinophilia is general, but the haemoglobin values are rarely below 70 per cent. and usually 70–80. Symptoms are rare. The worm is *Necator*. Badly affected children are, however, met with, chiefly in the lowlands

and among people who possess neither land nor cattle and live on maize and black beans; *i.e.*, the presence or absence of symptoms depends on the economic position of the family.

The authors found 4 children with *Schistosoma mansoni* infection, hitherto only suspected in Espirito Santo; the snail hosts were not discovered. Visceral leishmaniasis probably occurs. Leprosy occurs in Espirito Santo but not among the colonists. Tuberculosis is comparatively rare and venereal diseases are absent—this the result of the slightness of contact with the natives. Ulcers on the lower legs and elsewhere are common, usually non-specific but in some instances *ulcus tropicum*.

The action of the climate on the bodily constitution of the colonists is next considered. They do all the hard work, such as in the tropics is usually relegated to the natives—clearing, road-making, house building, etc., and the whole family, men, women and children, take part. Sunstroke and heatstroke are rare. Broad-brimmed hats and kerchiefs are worn during field work. The methods of cultivation lead to exhaustion of the soil and the colonists have overflowed on to the lowlands, where, moreover, the soil is more productive; there is no evidence, however, that they are any the worse. These are for the most part young people of the 2nd and 3rd generation.

As to body frame and growth the colonists show no essential difference from the agriculturists in North Germany; the lean type predominates. The authors think that the success of the German colonization of this district is due to the good, resistant constitutions of its founders and that the failure of similar attempts elsewhere is attributable to the unsuitability of the material.

They found no degeneration among the families, though such has been reported, and while marriage between near relatives is unusual they note that it must occur to some extent in the future.

Their study has shown them that German agriculturists can settle in tropical regions and they throw out the suggestion that "as soon as Germany is again in possession of her colonies" these Brazilian colonists might be transferred to them.

[Those interested in this tropical settlement who have access to a file of this *Bulletin* should consult 1920, Vol. 15, pp. 296-8 and 1935, Vol. 32, p. 65, especially the former.]

ii. After an interesting discussion of the literature with references to the views of SAPPER, CILENTO and others, Werner sums up to this effect:—

In the so-called marginal tropics (Randtropen) such as Espirito Santo and N. Queensland acclimatization of the white race has succeeded. Conditions of success are (a) the disappearance or recession of the most important tropical infections, malaria, yellow fever, ankylostomiasis; (b) that the coloured population be segregated or rendered hygienically harmless; (c) that bodily work be performed by the white colonists; (d) that the founders of the colony be healthy.

Acclimatization in stages (descent from the high ground to the plains) has proved useful.

For the true tropics (Innentropen) there is not yet sufficient information for a decision. No purely climatic factors are known such as would exclude possibility of acclimatization of the white races therein. For the present the hygienic factors are so unfavourable that its discussion seems premature, but it is not for all time without hope.

[It is interesting to note that according to Werner the Japanese have acquired from the Government of Brazil a million hectares of land in the *primaeval* forest of Amazonas for settlement of their excess population, a region hitherto regarded as the most unhealthy in the world.]

iii. The author considers the subject on the lines of an article which he has contributed to a forthcoming book of the same title. Half his space is given to malaria.

It seems that the greater part of the differences between racial incidence of any infective tropical disease is attributable to difference in opportunity for infection rather than to difference in susceptibility and that it is hard to isolate these two factors.

iv. The author has analysed the records of 1,044 children, born and bred in the tropics or subtropics, and admitted to the Tübingen home.

He prefaces his remarks by saying that not all those admitted are ill, some are quite healthy and accompany their parents. He reckons as tropics, Central Africa, S. China, India, New Guinea, Central America and the north of S. America; as subtropics, N. China, S. Africa, the Near East, and the rest of S. America [but only tells us that 707 came from the tropics and 337 from the subtropics].

Of malaria and dysentery the percentages diagnosed were for the tropics 4.5 and 6.5, and for the subtropics 1.5 and 9.5.

Severe malaria was rare. No information is given of the kind of dysentery. Two tables are given of the worm infestations, which affected 48.5 per cent. of the tropics children and 39 per cent. of the subtropical; one table gives the percentages of each intestinal worm in the two categories, the other the percentage of hookworm according to age. Of children from the German colonies in S. Brazil (numbers unstated) 64 per cent. harboured worms. Hookworm was most frequent in South Seas children. *Trichuris* headed the list in the tropical subjects. Liver and lung flukes and bladder bilharzia were not met with.

Of non-tropical infections, measles and whooping cough head the list [whether contracted in the tropics or at Tübingen is not clear]. Tuberculosis was rarely diagnosed; when present it affected the hilus glands and the subjects appeared well. The author notes the importance of inflammation of lymphatic tissues in the nose and throat region, met with frequently. Typical cases of rickets were seen from China and India.

Curves of the height and weight of children from hot countries and from Germany show that growth of both boys and girls from hot countries tops by a little that of German children and that though the weight curves are less definite, intersecting more than once, the weight of tropical children at all ages is not appreciably less than that of their fellows in the homeland. A table of the haemoglobin values (technique not given) shows 71.8 per cent. of tropical children as having over 80 per cent., 28.2 per cent. as having less than 80, and of these 3.2 per cent. as having less than 65 per cent. haemoglobin.

The conclusion reached is that the health of these children was satisfactory, that they had suffered to a considerable extent from tropical diseases, but that with the present knowledge of these diseases it is possible to rear white children in hot countries and to make of them strong and healthy adults.

v. The author treats the subject of rural health services in the tropics in full and comprehensive detail. Perusal of his paper will

repay readers of German. The problems with which he deals have, however, been discussed repeatedly in the reports of the D.M.S.'s. of many British colonies and in papers in the journals.

A. G. Bagshawe.

DERRICK (E. H.). **Laboratory of Microbiology and Pathology. Special Investigations.**—Reprinted from *Queensland Ann. Rep. of Director-General of Health & Med. Services 1935-36*. 6 pp. With 4 charts.

A hitherto undescribed type of fever occurring in Brisbane.

The fever lasts 7 to 24 days, with acute onset. Three types of fever are met with: (1) short type 7 to 11 days typhus-like, (2) typhoid type lasting 17 to 24 days, ending by lysis, (3) relapsing type suggestive of undulant fever.

Headache is a constant symptom and may be severe and persistent, with pain in the back and limbs.

Guineapigs can be infected by injection of blood from the cases or blood or liver from infected guineapigs. After an incubation period of 4 to 18 days they develop fever, lasting from 1 to 6 days. One attack of the fever in a guineapig renders it immune to reinfection. Blood culture in patients was negative and the Widal and Weil-Felix reaction were also negative. No spirochaetes or symptoms of Weil's disease were detected in any of the experimental animals, so far it has not been possible to correlate this disease with any known fever.

D. Harvey.

MOORE (Morris). La blastomicosis y la cromomicosis de la América del Norte y del Sur. [**Blastomycosis and Chromomycosis in North and South America.**]—*Bol. Inst. Clin. Quirúrg.* 1936. Vol. 12. Nos. 103-104. pp. 230-239 With 13 figs.

A general account which cannot well be abstracted, illustrated by pictures of the clinical condition (but no text description of cases), the tissue reactions and the growing fungus *Phialophora macrospora* and others. Of the former the author describes *Coccidioides immilis* and *C. brasiliensis*, *Paracoccidioides cerebriformis* and of the latter *Phialophora verrucosa* and *Acrotheca pedrosoi* [see this *Bulletin*, 1931, Vol. 28, p. 404; 1933, Vol. 30, p. 590]. He divides cases after a somewhat arbitrary clinical plan; Coccidioidal into eight forms: (1) Primarily of skin with generalization, (2) Primarily pulmonary, with generalization, but not affecting the skin; (3) Primarily pulmonary with secondary subcutaneous lesion; (4) Primarily pelvic, no skin lesions; (5) Primarily meninges without skin lesions; (6) Primarily in bone, secondary in skin; (7) Primarily in joints; (8) Primarily subcutaneous. Blastomycosis is classified on a pathological basis: (1) Papulo-ulcerative; (2) Verrucose and papillomatous; (3) Gummatous.

H. H. S.

JURUKOFF (B.). Massenhafte Erkrankungen beim Menschen hervorgerufen durch *Pediculoides ventricosus*. [**Human Infestation by *Pediculoides ventricosus*.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Mar. Vol. 41. No. 3. pp. 337-341. With 2 figs. [10 refs.]

In the district of Bourgas, close to the Black Sea in South-east Bulgaria, men are commonly infested by the mite *Pediculoides ventricosus*, which causes a very troublesome dermatitis.

The author gives a brief description of the mite (though he does not make it clear that it has been identified by a competent authority). It is found in great abundance among the refuse of cereals and on sacks, etc., and frequently on the bodies of men engaged in dealing with the sacks. Cases of dermatitis due to the mite are very common among these men, but the condition does not spread to the rest of the population. Irritation frequently lasts one to two weeks and reinfestation is common.

P. A. Buxton.

FRIMBERGER (Ferdinand). Mikropipette zur Anstellung der Blutkörperchen-Sedimentierungs-Reaktion aus Fingerbeerenblut oder aus Venenblut. [**Micropipette for the Determination of Sedimentation-Rate with Blood from Finger-Prick or from Vein.**]—*Muench. Med. Woch.* 1937. Jan. 1. Vol. 84. No. 1. pp. 25–26. With 4 figs.

A micro-technique is described which can be used with blood obtained either from a vein or from a finger-prick. A special pipette, two models shown in diagram, consists of a lower portion in which about 0.125 cc. of blood can be measured and accurately mixed with 5 per cent. citrate solution, and an upper portion (separated from the lower portion by a stopcock in the more expensive model) into which the mixture is drawn and in which the sedimentation is observed. Readings are taken every half-hour, and the maximum difference of two such readings is the figure recorded. The maximum difference can be obtained within 1 hour in the case of rapidly-sedimenting blood, and within 2½ hours in other instances. These figures are only comparable among themselves and not directly with figures obtained by any other method, and it is to be noted that tests carried out in parallel with the Westergren method have indicated that differences in cell-volume of the blood may affect the two methods differently. It is claimed that the author's technique gives results as good as, if not better than, those of the Westergren method. A further publication on the subject is stated to be forthcoming. P. H. Martin.

NAPIER (L. Everard) & DAS GUPTA (C. R.). **Haematological Studies in Indians. Part VI. Investigations in 100 Cases of Marked Anaemia amongst Tea-Garden Coolies.**—*Indian Jl. Med. Res.* 1937. Jan. Vol. 24. No. 3. pp. 855–909. With 17 charts.

This paper deals with an extensive haematological investigation in two series of definite cases of anaemia amongst tea-garden coolies who originally came from Upper Assam or different parts of India. The selection was made mainly on clinical grounds such as skin pallor, puffiness of the face, oedema of the legs and dyspnoea, and a Tallqvist reading of 50 per cent. or less was taken as a criterion for investigation. Haemic murmurs were common, the pulse rate varied from 90 to 100, while the systolic blood pressure was seldom above 110 mm. Hg. Koilonychia was not noted. Night blindness was a common complaint, but there were few other obvious signs of specific nutritional deficiency. Eighty out of 87 cases showed free hydrochloric acid without the administration of histamine. In no instance was pernicious anaemia encountered and with very few exceptions the anaemia was of the microcytic-hypochromic type. In 39 out of 41 cases the satisfactory response to treatment with large doses of iron indicated that the

anaemia originated in an iron deficiency. The conclusion reached was that hookworm infection was almost certainly the main factor in the production of this anaemia. As, however, a normal haemoglobin level may co-exist with a heavy hookworm infection, the authors consider there is probably some other factor that determines the incidence of anaemia in certain cases and not in others. The splenic index amongst these coolies varied from 28 to 39 per cent. Malaria, however, was not considered to be an important factor, as it produces a different type of anaemia with destruction of red cells, but without the loss of iron from the body which occurs in hookworm anaemia. The diets were ill-balanced and deficient in good protein and in fat, but there was little evidence of any vitamin deficiency, except possibly of A. Dietetic treatment alone produced no effect on the blood picture.

N. Hamilton Fairley.

WILLS (Lucy), CLUTTERBUCK (P. W.) & EVANS (Barbara D. F.).
A New Factor in the Production and Cure of Certain Macrocytic Anaemias.—*Lancet*. 1937. Feb. 6. pp. 311–314. With 6 figs. [13 refs.]

Tropical macrocytic anaemia is generally regarded as a deficiency state, due to lack of extrinsic factor in the diet. If this be so, then the final deficiency in the body must be in liver principle just as it is in pernicious anaemia. But in the latter disease spinal cord involvement is common and there is hyperbilirubinaemia and an increased output of urobilin in the urine, whereas in uncomplicated tropical macrocytic anaemia this is not the case. In rhesus monkeys suffering from nutritional anaemia there is no hyperbilirubinaemia.

With the object of investigating the problem of this nutritional macrocytic anaemia and of the haemopoietic factor or factors present in yeast and liver, certain monkey experiments were undertaken. The therapeutic activity of different extracts was judged by the height of the reticulocyte response and the rise in the red cell count and haemoglobin percentage following their administration. In rhesus monkeys, in which tropical macrocytic anaemia was experimentally induced, injections of campolon proved effective, though surprisingly large doses were often necessary to induce a maximal response. Injections of anahaemin on the other hand, which had been found by UNGLEY to be active in two cases of pernicious anaemia, were absolutely inactive even in a large dosage in monkeys which later responded to campolon. The activity of the relatively crude extract campolon, and the inactivity of the purified factor anahaemin, suggest that the causation of nutritional anaemia of monkeys cannot be lack of Castle's extrinsic factor in the diet and liver principle in the body. It would appear that some other factor is involved.

The relationship of the yeast factor to vitamin B₁₂ complex was also investigated and it was shown in rhesus monkeys that flavin was not the haemopoietic factor. The separation of the liver and yeast haemopoietic components from the vitamin B₁₂ component of the vitamin B₁₂ complex was next attempted by applying the method of Dakin and West for separation of anahaemin from crude liver extracts. Fractionation by the use of Reinecke salt which precipitated anahaemin led to disappointing results, but good results were obtained by using saturation with ammonium sulphate. Both yeast filtrates and campolon were by this means separated into fractions insoluble and

soluble in saturated ammonium sulphate. The two fractions from campolon were tested on both men and monkeys, and those from yeast on monkeys only. The insoluble fraction from campolon, which would contain any anahaemin present, induced an immediate remission in two untreated controlled cases of pernicious anaemia, though it was completely inactive in monkeys. The same monkeys subsequently responded to similar parenteral injections of the soluble fraction. Similarly, with yeast extract given *per os*, the insoluble fraction was completely inactive in anaemic monkeys which, however, responded to treatment with the soluble fraction.

The authors conclude that there is some evidence that both factors may be necessary for haemopoiesis in man and rhesus monkeys, but that in the production and cure of the nutritional anaemia of the monkeys it is the soluble fraction that is mainly implicated. Its action in tropical macrocytic anaemia of man is under investigation. The two factors must be present in those extracts of liver, yeast and wheat germ that are active either alone or after mixture with gastric juice in both the monkey nutritional anaemia and pernicious anaemia.

N. Hamilton Fairley.

KAMPMEIER (R. H.) & CAMERON (Paul B.). **Pernicious Anemia in the Negro.**—*Amer. Jl. Med. Sci.* 1936. Dec. Vol. 192. No. 6. pp. 751-756.

Although anaemia in various forms is found in the negro, true pernicious anaemia is regarded as a rarity.

The present series comprises 18 negroes with anaemia of megalocytic type. In 14 instances the authors consider the diagnosis of true Addisonian pernicious anaemia may be definitely accepted since there was macrocytic anaemia with a high colour index, achlorhydria and an appropriate response to liver extract therapy. Clinically the patients presented the same signs and symptoms as those seen in whites, but in a somewhat accentuated form owing to the disease being further advanced when the patients sought medical assistance. Cord changes manifested by numbness, ataxia, difficulty in walking, abnormal reflexes and loss of vibratory sense were strikingly common. Although only four of their series were known to be of mixed white and negro blood, it was quite possible the rest were also. For this reason the authors still accept the generally held opinion that pernicious anaemia probably does not occur in the pure blooded negro.

N. Hamilton Fairley.

CRANDALL (Noble F.). **Hemophilia in the Negro.**—*Amer. Jl. Med. Sci.* 1936. Dec. Vol. 192. No. 6. pp. 745-751. With 2 figs. on 1 plate.

In a careful review of the literature the author found not a single instance of undoubted haemophilia in the negro. The present paper records a typical example except that there was no definite genealogy of this disease. Two brothers, a maternal uncle and grandfather, had, however, been subjects of frequent nose-bleeding. The patient was a very black negro with a history of immoderate haemorrhage from several sources during early childhood. He had developed haemarthrosis of the left knee joint and joint changes similar to those found in haemophilia. In only 1 out of 13 examinations was the

coagulation time of the blood normal, this exceptional finding being recorded during an active period of haemorrhage. The coagulation time was still markedly prolonged five months after cessation of haemorrhage. The platelet count, the tourniquet test, the clot retraction and the Wassermann and Kahn tests were all negative.

N. Hamilton Fairley.

FENG (L. C.). **The Hibernation Mechanism of Mosquitoes.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Mar. Vol. 41. No. 3. pp. 331–337. With 2 figs. [14 refs.]

The author reports his observations on the hibernation of mosquitoes in the neighbourhood of Peiping, China.

Aedes koreicus breeds in summer in earthenware pots used for domestic purposes. In winter the custom is to dry these pots and leave them in the open inverted, and it is found that live eggs continue to exist on the inside of the pot, even though exposed to temperatures as low as -15°C .; the author recovered living eggs from 31 out of 42 pots examined. The rot holes in trees are generally dry throughout the winter, and indeed until the rains of the following July, but two species of *Aedes* survive this long period as eggs. *Anopheles pattoni* goes through the winter as a larva which will withstand freezing in a block of ice for several months: *A. lindesayi* also passes the winter as a larva. *Culex pipiens* var. *pallens* hibernates as a fertilized female.

P. A. Buxton.

JOBLING (B.). **The Development of Mosquitoes in Complete Darkness.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 467–474. With 2 figs.

The experiments show that the larvae of *Culex pipiens*, *C. fatigans* and *Aedes argenteus* develop successfully in complete darkness. Mosquitoes can also pair and lay eggs under the same conditions. The ability of these larvae to feed and grow in the absence of light is rendered possible by their feeding habits; they take many types of organic material, living and dead, but do not require green plants, which could not be present in complete darkness.

P. A. B.

ROUBAUD (E.), TREILLARD (M.) & TOUMANOFF (C.). Nouvelles expériences d'intercroisement de biotypes chez l'*Anopheles maculipennis*. [New Experiments in the Crossbreeding of Biotypes in *Anopheles maculipennis*.]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 898–901. With 3 figs.

Impelled thereto by the experience and assertions of Dutch writers, who consider that the races *typicus* and *atroparvus*, which exist together in the Netherlands, are in nature mutually sterile, the present authors have undertaken and are still conducting crossbreeding experiments, the results of which indicate that it is possible to obtain during several generations perfectly fertile and viable hybrids between the *typicus* and *atroparvus* groups. Egg-characters in support of this statement are described and figured. The races or varieties employed in the experiments were the Portuguese *cambournaci* (a near ally of the ordinary European *atroparvus*), and a Parisian strain of *A. maculipennis* var. *typicus*.

It is believed that hybrids such as those described in this paper are actually met with in nature. E. E. Austen.

YAMADA (Manabu). **Four Kinds of Anopheline Mosquitoes in Chosen.**
—*Keijo Jl. of Med.* 1936. Sept. 25. Vol. 7. No. 2. pp. 191–210.
With 10 plates. [24 refs.]

The anopheline fauna of Chosen (Korea) consists of three species and a variety:—*A. koreicus*, *A. sineroides*, *A. edwardsi*, and *A. hyrcanus* var. *sinensis*. Of these the last mentioned "is the most common and the other three are extremely rare"; while *A. hyrcanus* var. *sinensis* is practically ubiquitous, the remaining species, which breed by preference in cool water, are found for the most part in the hills. No detailed descriptions of the egg, larva and pupa of *A. koreicus*, *A. sineroides* and *A. edwardsi* have hitherto been published. The author, however, has, since 1932, reared these species in the laboratory, and now describes and gives detailed illustrations of their eggs, fourth stage larvae and pupae, as well as of the corresponding stages of *A. hyrcanus* var. *sinensis*. The descriptions are followed by a synoptic table of the female adults, and keys to the various stages. Figures of the female wing, and other adult characters, in *A. sineroides*, *A. koreicus* and *A. edwardsi* are given in the concluding plate.

E. E. A.

BONNE-WEPSTER (J.) & BRUG (S. L.). *Nederlandsch-Indische Culicinen.*—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. Mar. 2. Vol. 77. No. 9–10. pp. 515–617. With 47 figs. [11 refs.]

STONE (William S.). **A Method of staining Protozoa in Bulk.**—*Jl. Lab. & Clin. Med.* 1936. May. Vol. 21. No. 8. pp. 839–842. With 1 fig.

The method described is that of adding the fixative, *e.g.*, Schaudinn's fluid, to a liquid or emulsion containing protozoa. By centrifuging and removal of supernatant fluid after the addition of each necessary liquid it is possible to stain, dehydrate and clear and bring into xylol balsam the sediment, which can then be placed on a slide and mounted under a cover glass. The method was described by the reviewer in his "Protozoology" p. 1324. C. M. Wenyon.

GÖNNERT (R.) & WESTPHAL (A.). *Zur Technik der Stuhluntersuchung auf Protozoen.* [**Technique of Stool Examination for Protozoa.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Jan. Vol. 40. No. 1. pp. 5–16.

In actual practice it is often impossible to be in a position to examine the faeces of an individual on more than one occasion for intestinal protozoa. To test the value of the single specimen examination the authors have examined at Hamburg 444 persons from various parts of the world. The single normal stool of each was subjected to various tests, as follows:—fresh preparations, stained films, concentration, and cultivation in five different media. The general result has been the demonstration of protozoa in 69.3 per cent. of the specimens, which were made up as follows:—*E. histolytica* 34.9 per cent., *E. coli* 19.8 per cent., *I. bütschlii* 17.1 per cent., *E. nana* 17.1 per cent., *D. fragilis* 26.4 per cent., *Lambliä* 13.5 per cent.,

Trichomonas 2.5 per cent., *Chilomastix* 1.4 per cent., *Tricercomonas* 4.3 per cent. For details of the method of carrying out the examination the original must be consulted.

C. M. W.

HEGNER (Robert). **Reactions of Intestinal Protozoa to Environmental Changes *In Vitro* and *In Vivo*.**—*Rev. Parasit., Clin. y Lab.* Habana. 1936. May–June. Vol. 2. No. 3. pp. 385–401. [43 refs.]

In this paper the author gives a general account of a series of investigations which have been carried out in his laboratory during the past 15 years. The results have been already published in a number of papers, but here is a very useful summary of the results. The subject has to do with the reaction of intestinal protozoa to normal and modified environmental conditions *in vitro* and *in vivo*. To this end various types of culture media were employed, as also young chicks, which proved to be easily infectible with certain intestinal protozoa of man and animals, and rats which had been freed of their trichomonad infections by the administration of carbar-sone (0.1 gm. in drinking water for five days). The experiments appeared to indicate that intestinal protozoa maintained themselves in the intestine of animals only in the presence of starch, but so far it has not been possible to prove that this applies to man. Certain clues were obtained as to the influence of hydrogen-ion concentration and variations in the bacterial flora of the intestinal contents. Similarly the growth of protozoa in culture media depends on various factors. It has been shown that faecal extracts added to the culture media favour growth in many cases. Investigations of the type indicated are still in progress and it is hoped that these will throw further light on the influence of environmental changes on intestinal protozoa.

C. M. W.

HEGNER (Robert). **Viability of Parasitic Protozoa after the Death of the Host.**—*Amer. Jl. Hyg.* 1936. Sept. Vol. 24. No. 2. pp. 309–317.

In warm-blooded animals protozoa remain alive after the death of the host for periods which vary with the temperature. Thus trichomonads in the dead rat live for 24 hours at a temperature of 37°C., and for 13 days at 5°C. Balantidia were alive in the caecum of the guineapig after four days both at laboratory temperature and at 5°C. In the frog intestinal protozoa live for 2 to 20 days. In canaries *Plasmodium cathemerium* was capable of infecting birds after 48 hours at 5°C. *Trypanosoma lewisi* was similarly alive after 3 days at room temperature and after 10 days at 5°C.

C. M. W.

FRYE (William W.) & MELENEY (Henry E.). **Intestinal Protozoa in Human Autopsies.**—*Jl. Parasitology.* 1936. June. Vol. 22. No. 3. pp. 300–301.

The examination of the colon in 46 autopsies showed intestinal protozoa in five (*Trichomonas hominis* 3, *Giardia intestinalis* 1, *Endolimax nana* 1). Living trophozoites of *Giardia* and *Trichomonas* were present 12 or more hours after death. The incidence of the infections was lower than that given by examinations of cases during life, and it is concluded that many infections are lost during the course of the final illness.

C. M. W.

JAHN (Theodore Louis). **Effect of Aeration and Lack of CO₂ on Growth of Bacteria-Free Cultures of Protozoa.**—*Proc. Soc. Experim. Biol. & Med.* 1936. Jan. Vol. 33. No. 4. pp. 494–498. With 1 fig.

As CO₂ appears to be necessary to the growth of bacteria, yeasts and moulds on solid media, it was thought advisable to test the value of CO₂ in the cultivation of certain protozoa. The test was made on bacteria free cultures of *Glaucoma piriformis* and *Chilomonas paramecium* in heavily buffered casein peptone medium through which varying quantities of CO₂ were passed. As regards *G. piriformis* lack of CO₂ has apparently no effect on the growth, whereas on that of *C. paramecium* it causes a lower initial growth rate and a prolongation of the initial lag period. It is suggested that in those cases where absence of CO₂ from the medium hinders growth this is due to the consequent abstraction of CO₂ from the organisms, causing a shift in the bicarbonate buffer system and possibly a change in pH of the protoplasm.
C. M. W.

BRUG (S. L.). **A Simple Method of plotting Logarithmic Growth-Curves of Protozoal Cultures.**—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 357–359. With 1 diagram.

In order to chart the rise and fall of the number of organisms occurring from day to day in cultures of protozoa convenient curves are obtained by charting on millimeter squared paper the log to the base 2 of the number of organisms present at any time, instead of either the actual numbers or the usual log to the base 10.

C. M. W.

DOBELL (Clifford). **Researches on the Intestinal Protozoa of Monkeys and Man. VII. On the *Enteromonas* of Macaques and *Embado-monas intestinalis*.**—*Parasitology.* 1935. Oct. Vol. 27. No. 4. pp. 564–592. [51 refs.]

In this paper the author discusses experiments he has carried out with *Enteromonas hominis* and *Embado-monas intestinalis*, two intestinal flagellates of man which it is concluded are identical with similar forms in certain monkeys. As regards the nomenclature of the former, it is noted that a previous conclusion was reached in 1921 that the flagellate described by WENYON and O'CONNOR in 1917 as *Tricercomonas intestinalis* probably represented FONSECA's *Enteromonas hominis* which, however, was never correctly described by that observer. It is now recorded that the reviewer was able to obtain FONSECA's type specimens and that he and the author were able to see that the flagellates in those slides had the structure of the organism described as *T. intestinalis* by WENYON and O'CONNOR. It follows therefore that the flagellate named *Enteromonas hominis* by FONSECA in 1915 had actually this structure and that, as the author had inferred in 1921, *Tricercomonas intestinalis* becomes a synonym of *Enteromonas hominis*, which is the correct name for the flagellate. It is further concluded that the flagellates which have been described from monkeys or man under the names *Octomitus* and *Hexamita* are merely double individuals of *Enteromonas* resulting from arrested binary fission, such forms being of common occurrence in cultures.

The cultivation of *E. hominis* is described, as also an unsuccessful attempt to infect man by administering cysts produced in a culture of a monkey strain.

As regards *Embadomonas intestinalis* the author points out that he is in disagreement with the view expressed by WENRICH that Grassi's original genus *Retortamonas*, founded for a flagellate of the mole-cricket, has priority over the name *Embadomonas*, which would be merely a synonym. He points out that these genera, as defined by their founders, have almost nothing in common. The name *Embadomonas intestinalis* for the flagellate of man is thus, in the author's opinion, the correct one. The flagellate has been cultivated by him from man, but two attempts to infect monkeys have failed. In spite of this failure, and that with *Enteromonas hominis*, the author is of the opinion that the evidence produced in other respects is sufficient to justify the conclusion that it seems probable that these flagellates are common to man and monkeys, and that only one species of such exists in these hosts. C. M. W.

DOBELL (Clifford). **Researches on the Intestinal Protozoa of Monkeys and Man. VIII. An Experimental Study of Some Simian Strains of "*Entamoeba coli*."**—*Parasitology*. 1936. Oct. Vol. 28. No. 4. pp. 541-593. [46 refs.]

This paper, the eighth of the series dealing with the relationship of the intestinal protozoa of monkeys to the morphologically similar forms in man, describes, in that meticulous detail to which readers of the series have become accustomed, the exhaustive investigations which have led to the conclusion that the *Entamoeba coli*-like amoeba of certain oriental monkeys and the common marmoset is actually *Entamoeba coli* itself. Pure strains of the amoeba, that is, strains uncontaminated with other protozoa, have been isolated in culture from man and monkeys and cross infections successfully produced. In macaques these have persisted for from one to four and a half years, while an infection produced in man by a strain from the marmoset after passage through a macaque has already persisted for two years. A previous infection with a strain from a macaque lasted in the same individual, the author, for about six weeks. On many occasions the presence of the amoebae can only be determined by culture methods which, as far as *E. coli* is concerned, are more difficult to apply than to any other intestinal amoeba of man or monkey. Much depends on the presence of the right bacteria, the best of which, in these experiments, were obtained from the faeces of the marmoset. With this combination of unidentified bacteria it has been possible to cultivate *E. coli* from any infected host and to maintain it satisfactorily throughout its entire life history in subculture, provided careful supervision, particularly as regards the correct temperature, is given. Cysts from cultures were very resistant to cold, one batch proving viable after having been kept at 1°-2°C. for 135 days. At ordinary room temperature cysts from cultures will survive for 51 days. It has been found impossible to infect kittens with this amoeba, which in all the experiments has shown no sign of pathogenicity either to man or monkey. A number of strains have been proved to ingest red blood corpuscles as readily as does *E. histolytica* when these have been added to the cultures. The author therefore finds it impossible to believe that *E. coli* is unable to do the same when in the human intestine,

and concludes that the finding of amoebae containing red blood cells in a human stool cannot be accepted alone as unquestionable evidence of infection with *E. histolytica*. Most protozoologists of experience will no doubt agree with this, though it must be a very rare occurrence for anyone to base a diagnosis of *E. histolytica* on this single character alone. The reviewer cannot remember ever having done so. It is perhaps not fully realized that in the actual practice of faeces examination for the presence of protozoa it is a relatively rare experience to observe amoebae with included red blood corpuscles even in cases of undoubted *E. histolytica* infection. That *E. coli* in the human intestine may occasionally ingest red blood corpuscles seems probable, though this has not yet been demonstrated, but its occurrence must be so rare that errors of diagnosis resulting from it must be almost negligible. The reviewer, who may claim to have had a fair experience of examinations for protozoa, has never seen in faeces an *E. coli* with ingested red blood corpuscles.

C. M. W.

KNOWLES (R.) & DAS GUPTA (B. M.). **Some Observations on the Intestinal Protozoa of Macaques.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 547–556. With 20 figs. on 1 plate. [15 refs.]

The paper gives a record of the results of examination for intestinal protozoa of 27 monkeys (*Silenus irus*). Amoebae, flagellates and ciliates corresponding in structure with all the common intestinal protozoa of man, with the exception of *Embadomonas intestinalis*, were found. A human volunteer was successfully infected with *E. nana* of the monkey.

C. M. W.

REDAELLI (Piero). L'épreuve pexique au rouge Congo dans l'histoplasme expérimentale. (Réticulo-histiocytose systématique par "Histoplasma capsulatum" Darling.) Note préliminaire.—[**Congo Red Pexic Test in Experimental Histoplasmosis.**]—*Boll. Sezione Ital., Soc. Internaz. di Microbiologia.* Milan. 1935. Aug.–Sept. Vol. 7. No. 8–9. pp. 312–316.

The paper suggests that the successful development of histoplasma and leishmania in animals depends on the power of the cells of the reticulo-endothelial system to ingest them. This power can be gauged by the congo red test, in which the phagocytic capacity of these cells can be estimated from the extent of the ingestion of the dye when this is injected.

C. M. W.

ESCOMEL (E.). Entérocôlite par *Enteromonas hominis* au Pérou. [**Enterocolitis associated with *E. hominis* in Peru.**]—*Bull. Soc. Path. Exot.* 1935. Oct. 9. Vol. 28. No. 8. pp. 710–713.

The author believes that the small intestinal flagellate *Enteromonas hominis*, like other intestinal flagellates, is capable of giving rise to a condition of entero-colitis. For this flagellate infection oral administration of a mixture containing essence of terebinth and paregoric is almost a specific treatment.

C. M. W.

LIMINE (M.). La coccidiose humaine en Abkhasie. [**Human Coccidiosis in Abkhazia.**]*—Bull. Soc. Path. Exot.* 1935. Dec. 11. Vol. 28. No. 10. pp. 914-915.

The report deals with human coccidiosis (*Isospora belli*), 19 cases of which were seen in 1931 in Abkhazia, on the eastern coast of the Black Sea. The ages of the patients varied from 2 to 30 years. Gastro-intestinal symptoms were present in several, one case being in hospital for 24 days. Faecal examinations remained positive for about four months.
C. M. W.

ABRIL CÁNOVAS (Mariano) & DARRIBA (Antonio R.). Un caso de parasitismo humano por coccidia (*Isospora belli*) en España. [**Human Infection with *I. belli* in Spain.**]*—Medicina Países Cálidos.* Madrid. 1935. Oct. Vol. 8. No. 10. pp. 475-480. With 3 figs. English summary (3 lines).

The paper describes a case of coccidial (*Isospora belli*) infection in a child eight years of age at Orihuela (Alicante).
C. M. W.

CORCUFF (C.). Deux observations d'*Isospora belli* au Maroc. [**Two Observations of *I. belli* in Morocco.**]*—Ann. Parasit. Humaine et Comparée.* 1936. Sept. 1. Vol. 14. No. 5. pp. 440-443. With 2 figs.

In each of these cases oöcysts of the coccidium were found in the stools on two occasions at intervals of a few days. The symptoms, which appeared to be due to the coccidial infection, as no other cause could be found, were somewhat indefinite and consisted of colic, diarrhoea and general debility.
C. M. W.

SMYLY (H. Jocelyn) & CHANG (Kuei). **Two Cases of Coccidiosis in Man.**
—Chinese Med. Jl. 1936. Sept. Vol. 50. No. 9. pp. 1195-1202. With 5 figs. [11 refs.]

A record of two cases of *Isospora belli* infection in N. China, one in a Chinese male hospital assistant and the other in an English lady. There were no symptoms attributable to the coccidial infection.

C. M. W.

GALLIARD (H.). Premier cas de coccidiose humaine à *Isospora belli* Wenyon 1923 signalé au Tonkin. [**First Case of Human *I. belli* Infection in Tonking.**]*—Bull. Soc. Path. Exot.* 1936. Feb. 12. Vol. 29. No. 2. pp. 118-120.

A child two years of age, suffering from diarrhoea and much emaciated, was admitted to the hospital at Hanoi five days before its death. On the first and second days in hospital there were detected in the stools oöcysts of *Isospora belli* and eggs of ascaris. After that the stools became more liquid and the only finding was ascaris eggs on the fourth day. After death the intestine was carefully examined at various levels by scraping and section for evidence of coccidial infection, but nothing was found.
C. M. W.

IVANIĆ (Momčilo). Ueber den Bläschenkernbau und die promitotische Kernteilung eines im menschlichen Enddarme lebenden Pilzes (*Blastocystis hominis* Brumpt). [**Structure of Vesicular Nucleus and Promitotic Nuclear Division of *B. hominis*.**]—*Arch. f. Protistenk.* 1936. Vol. 87. No. 2. pp. 242–247. With 14 figs.

The fungus-like organism *Blastocystis hominis* possesses a nucleus of a vesicular type with central karyosome and peripheral chromatin. When the nucleus divides it does so by mitosis in which the karyosomes form pole caps and the chromatin an equatorial plate represented by what are apparently two chromosomes. C. M. W.

REDAELLI (P.) & CIFERRI (R.). Une nouvelle hypothèse sur la nature du *Blastocystis hominis*. [**A New Hypothesis as to the Nature of *Blastocystis hominis*.**]—*Boll. Scizione Ital., Soc. Internaz. di Microbiologia.* Milan. 1935. Aug.–Sept. Vol. 7. No. 8–9. pp. 321–325.

The view is expressed that *Blastocystis* is a member of the family Protothecaceae Printz. C. M. W.

REDAELLI (P.) & CIFERRI (R.). Argomenti a favore di una sistemazione del genere "*Blastocystis*" nelle Algae. [**Arguments in Favour of placing the Genus *Blastocystis* in the Algae.**]—*Boll. Istituto Sieroterap. Milanese.* 1936. Mar. Vol. 15. No. 3. pp. 154–170. With 7 figs. on 1 plate. '64 refs.] German summary.

This is a long paper in which the author argues that *Blastocystis* is actually one of the algae related to *Prototheca portoricensis* of the family Chlorophyceae. C. M. W.

CIFERRI (R.) & REDAELLI (P.). Morfologia, biologia e posizione sistematica di *Coccidioides immitis* Stiles e delle sue varietà, con notizie sul granuloma coccidioidico. [**Morphology, Biology and Systematic Position of *Coccidioides immitis* and of its Varieties, with Notes on Coccidioidal Granuloma.**]—Reprinted from *Mem. R. Accad. Ital.* 1936. Vol. 7. pp. 399–475. With 13 figs. & 8 plates. [90 refs.]

In this article the authors discuss *Coccidioides immitis* from every point of view and show how it is related to other fungoid organisms such as *Histoplasma* and *Rhinosporidium*. Its characters, life history, pathology and culture are fully described and illustrated, the whole article being a comprehensive treatise on the subject. Mycologists are referred to the article for full details. C. M. W.

FANTHAM (H. B.) & PORTER (Annie). **Some Entozoa of Man as seen in Canada and South Africa.**—Reprinted from *Canadian Med. Assoc. J.* 1936. Vol. 34. pp. 414–421.

In this article the results of the examination of human beings for intestinal protozoa and helminths in Montreal are compared with those previously obtained in Johannesburg. It is noted that the general similarity of the infections is striking, the figures, with a few exceptions

which are easily explicable, being comparable. It has to be noted that the examinations were not necessarily confined to the indigenous population.

C. M. W.

COATNEY (G. Robert) & ROUDABUSH (Robert L.). **A Catalog and Host-Index of the Genus *Plasmodium*.**—*Jl. Parasitology*. 1936. Aug. Vol. 22. No. 4. pp. 338–353. [230 refs.]

This very useful catalogue of the genus *Plasmodium* gives a list of the various species of the genus and lists of the hosts under the headings Reptilia, Aves and Mammals. A very full bibliography is appended.

C. M. W.

SASSUCHIN (D.). Blutparasitäre Krankheiten der Nager und einiger anderer Säugetiere. [**Blood Parasites of Rodents and Other Mammals.**]—*Rev. Microbiol., Epidémiol. et Parasit.* 1936. Vol. 15. No. 1. [In Russian pp. 45–56. With 3 figs. & 1 plate. [34 refs.] German summary p. 56.]

During investigation work on plague, typhus, leishmaniasis and other diseases in the past three years in S.E. Russia, a number of rodents and other small mammals have been subject to laboratory experiment. The blood of 34 species has been examined for blood parasites, with the result that species of the following parasites have been recorded:—*Hepatozoa*, *Grahamia*, *Piroplasma*, *Nuttallia*, *Toxoplasma*, *Trypanosoma* and *Leucocytozoon*. In various lists the hosts and species of parasite are given. The exact meaning of *Leucocytozoon* found in smears of the organs is not clear but the microphotograph of the parasite, which is recorded only from one mouse, suggests spores of *Sarcocystis*.

C. M. W.

BYRD (Elon E.). **Studies in Parasitology. V. The Intestinal Parasites in 257 College Freshmen.**—*Jl. Parasitology*. 1936. June. Vol. 22. No. 3. pp. 301–302.

The stools of 257 freshmen at the University of Georgia were examined for intestinal protozoa with the following results in percentages:—*Endolimax nana* 23·73, *Entamoeba coli* 22·18, *Giardia intestinalis* 12·84, *E. histolytica* 7·78, *Iodamoeba bütschlii* 2·72, *Chilomastix mesnili* 0·38, *Trichomonas hominis* 0·38, *Blastocystis hominis* 11·67.

C. M. W.

BROOM (J. C.), BROWN (H. C.) & HOARE (C. A.). **Studies in Microcataphoresis. II. The Electric Charge of Haemoflagellates.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. June 30. Vol. 30. No. 1. pp. 87–100. With 4 figs. [16 refs.]

The determination of the electric charge of trypanosomes from the blood of infected mice, rats and guineapigs has shown that this may be either positive or negative. As a rule, if the infection in the animal is a continuous one leading to death, the charge of the trypanosome remains constant throughout. If, on the other hand, the trypanosomes disappear from the blood for a period and then reappear again in a relapse, it is found that the reappearance is associated with a reversal of the charge. On one occasion, however, the charge of *Trypanosoma*

brucei changed during the course of a continuous mouse infection. Drug-resistant strains had the same charge as the normal strains. A change of host, such as mouse to guineapig, may bring about a change in charge. The cultural forms of trypanosomes and leishmania and the developmental forms of the sheep trypanosome (*T. melophagium*) in the ked are all negatively charged. It has been shown that the positive variant of a strain of *T. evansi* was distinctly more susceptible to the action of tryparsamide than the negative one. A simple test for the determination of the charge of a trypanosome is described as follows:—Add 0.002 cc. of infected blood to 0.3 cc. of a mixture of one volume of normal saline and nine volumes of 4 per cent. glucose. Interaction is allowed to occur for half an hour at room temperature, when a drop of the suspension is observed with a one-sixth objective. Positively charged trypanosomes will be adherent to the red blood corpuscles, while negatively charged ones will be free. C. M. W.

WAGNER (O.) & HEES (E.). Der kulturelle Nachweis von *Trichomonas vaginalis* und anderen Trichomonasarten. [Cultural Demonstration of *Trichomonas vaginalis* and Other Species of *Trichomonas*.]—*Zent. f. Bakt.* I. Abt. Orig. 1935. Nov. 15. Vol. 135. No. 4/5. pp. 310-317.

— & —. 156 positive Trichomonasblutbefunde bei Mensch und Tier. [156 Positive Trichomonas Findings in the Blood of Man and Animals.]—*Ibid.* 1937. Feb. 16. Vol. 138. No. 5/6. pp. 273-290. With 7 figs. [11 refs.]

These two papers have to do with the cultivation of various trichomonads. In the first paper the forms mostly dealt with are *T. vaginalis*, the similar form which inhabits the genital tract of cattle, and the pigeon trichomonas. By cultivation methods trichomonas has been isolated in the case of human beings not only from the vagina but also from the upper parts of the genital tract, from ovarian cysts and retroperitoneal abscesses and other similar situations. Cultures from cattle have been made on the same lines, while in the case of the pigeon trichomonas this has been inoculated intraperitoneally to mice, leading to liver abscesses in the pus of which the flagellate occurred in enormous numbers. Trichomonas has also been cultivated from the human alimentary canal, including the mouth and throat. It is also stated that trichomonas was grown from arm venous blood. For cultivation of trichomonas with bacteria the medium found most useful is the one used for the dysentery amoeba—a horse serum slope covered with a 10 per cent. solution of egg albumin in buffered physiological saline. The bacterial growth is kept down by removing and renewing the liquid every day. The main growth of flagellates occurs at the lower end of the tube and enough are left each day to continue the culture. Other media mentioned are serum and blood bouillon which, however, are not so useful as the amoeba medium, at any rate for the bacterially contaminated cultures.

The second paper deals especially with cultivation of trichomonas from the blood, a brief mention of which was made in the first. It is not stated definitely what was the technique of blood culture, but presumably the method used was that discussed in the first paper. In the case of human beings, the majority of whom were women with vaginal infection, of 75 cases a positive result was obtained in 55. In some of these cases, both women and men, there was no evidence of

infection elsewhere than in the blood. Similar results were obtained with horses and cattle. It is not concluded that the blood trichomonas, which were only demonstrable by culture methods, are in any way pathogenic. It would seem that they gain entrance to the blood when there are lesions which allow of their passage through the membranes.

C. M. W.

BLAND (P. Brooke) & RAKOFF (A. E.). **Some Bacteriologic Aspects of *Trichomonas vaginalis* Vaginitis.**—*Vida Nueva*. 1936. May 15. Vol. 37. No. 5. pp. 467-484. With 6 figs. [28 refs.]

An attempt has been made to investigate the nature of the bacterial flora associated with *Trichomonas vaginalis* infections. It is found that the flora is an abnormal one and that any such abnormal flora will conduce to infection with the flagellate if this is not already present. The type of relationship between the flagellates and the bacteria is not properly understood, but it has been noted that Döderlein's bacilli make their appearance as the flagellates disappear, while the appearance of the flagellates is always associated with the disappearance of these bacilli.

C. M. W.

VAZQUEZ-COLET (Ana) & TUBANGUI (Marcos). **The Identity and Incidence of a Flagellated Protozoan Parasite found in Human Urine.**—*Jl. Philippine Islands Med. Assoc.* 1936. Apr. Vol. 16. No. 4. pp. 231-234. With 1 fig.

The paper records the presence of *Trichomonas vaginalis* in the Philippines. It is noted that in urine the flagellate may degenerate and be erroneously identified as some other protozoan such as *Prowazekia urinaria*. The question arises as to whether this organism is not merely a degenerate *Trichomonas*. *T. vaginalis* was found in the urine of both women and men. Inoculated into the vagina of monkeys the culture forms in Barrett's medium produced infection in one instance. No evidence that *T. vaginalis* is pathogenic was obtained. It was shown that it would remain viable outside the body in a semi-dry state for at least six hours.

C. M. W.

MILLER (James Raglan). **Contrast Stain for the Rapid Identification of *Trichomonas vaginalis*.**—*Jl. Amer. Med. Assoc.* 1936. Feb. 22. Vol. 106. No. 8. p. 616.

The examination of pus for the presence of *Trichomonas vaginalis* is facilitated by mixing with 0.1 per cent. safranin solution, whereby the unstained flagellates stand out in contrast to the stained pus cells around them.

C. M. W.

WENDLBERGER (J.). **Zur Pathogenität der *Trichomonas vaginalis*. [Pathogenicity of *Trichomonas vaginalis*.]**—*Arch. f. Dermat. u. Syph.* 1936. Oct. 28. Vol. 174. No. 6. pp. 583-590. With 2 figs. [10 refs.]

By using cultures of *Trichomonas vaginalis* to prepare trichomonas antigen the author claims to have shown that the serum of infected individuals may give a complement fixation reaction, so that he concludes that the organism in these cases is definitely pathogenic.

C. M. W.

CICCHITTO (Angelo M.). Sulla patogenicità del *Trichomonas intestinalis*. [Pathogenicity of *T. intestinalis*.]—*Ann. di Med. Nav. e Colon.* 1936. Jan.-Feb. 42nd Year. Vol. 1. No. 1-2. pp. 27-33. [22 refs.]

— Sulla patogenicità del *Chilomastix mesnili*. [Pathogenicity of *C. mesnili*.]—*Polislinico*. Sez. Prat. 1936. May 25. Vol. 43. No. 21. pp. 955-8, 961-2, 965-6. [29 refs.]

From observations on 28 cases of trichomonas and 31 cases of chilomastix infection the author argues in favour of the pathogenicity of these flagellates. In these infections stovarsol and yatren treatment is to be regarded as specific. C. M. W.

WESTPHAL (Albert). Zur Morphologie, Biologie und Infektionsfähigkeit der viergeisseligen Trichomonasarten des Menschen. [Morphology, Biology and Infectivity of the Quadriflagellate Species of the Trichomonads of Man.]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Oct. 6. Vol. 137. No. 6/7. pp. 363-376. With 9 figs. [50 refs.]

An investigation of human trichomonads has convinced the author that there are three species possessing four flagella. The intestinal form, *Trichomonas hominis*, has a free flagellum extending beyond the undulating membrane and is easily cultivated; *T. elongatum* of the mouth is not so easily cultivated, has a poorly developed basal fibre and no free flagellum; *T. vaginalis* is still less easily cultivated, has a well developed basal fibre and no free flagellum. C. M. W.

BECKER (Elery R.) & MOREHOUSE (Neal F.). Vitamin G from Different Sources and Coccidian Infection.—*Proc. Soc. Experim. Biol. & Med.* 1936. May. Vol. 34. No. 4. pp. 437-439.

The authors, who have previously shown that the development of coccidia (*Eimeria miyairii*) in the rat is hindered if the animals are deprived of vitamin G, now show that the development is stimulated if the diet is made rich in this vitamin. The experiments conclusively indicate that coccidium growth is tied up with the vitamin G complex. C. M. W.

NISHIYAMA (Masao). Ueber das Vorkommen von Darmspirochäten bei Menschen und Tieren. [Incidence of Intestinal Spirochaetes in Man and Animals.]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Apr. 30. Vol. 136. No. 5/6. pp. 370-382. With 2 figs.

The examination of human beings of all ages in Japan has shown that spirochaetes of the type *S. caryograta* and *S. stenograta* are of fairly frequent occurrence in the caecum and colon. They are not to be regarded as in any way pathogenic. A record is also given of the occurrence of spirochaetes in the faeces of a number of animals in the zoological gardens of Ueno. C. M. W.

BRUG (S. L.). On Particular Binucleate Bodies often found in Human Faeces.—*Ann. Trop. Med. & Parasit.* 1936. Apr. 8. Vol. 30. No. 1. pp. 33-35. With 18 figs.

The author has frequently found in human faeces cyst-like bodies measuring from 5 to 8 microns in longest diameter. The cyst wall,

often subject to irregular thickening, encloses a cytoplasmic body which does not fill the cyst, so that a space is left between it and the cyst wall. Within the cytoplasm are two deeply staining granules or nuclei. If a large vacuole occurred in the cytoplasm there would be resemblance to blastocystis. It is possible that the cysts described may have some connexion with this parasite. The author refers to them as Bosman-cysts from the name of the first individual in whom he found them.

C. M. W.

IVANIĆ (Momčilo). Beiträge zur Kenntnis der Entwicklungsgeschichte einer im menschlichen Enddarme lebenden *Endolimax*-Amöbe (*Endolimax gildemeisteri* spec. nov.). [Development of an *Endolimax* from the Human Large Intestine (*E. gildemeisteri* n. sp.)]—*Zent. f. Bakt.* I. Abt. Orig. 1936. Oct. 6. Vol. 137. No. 6/7. pp. 377–398. With 10 text figs. & 60 figs. on 1 double plate. [14 refs.]

From a human stool which was thought to contain entamoebae the author made stained preparations. An examination of these convinced him that the organism was not an entamoeba, though entamoeba-like forms were present, but a species of *Endolimax* which, however, appeared to be distinct from *E. nana*. The amoeba itself is very variable in form, multiplies by binary fission, has a nucleus dividing by promitosis or mitosis and gives rise in some cases to multinucleate forms and "resting stages" with eight nuclei. A new species, *Endolimax gildemeisteri*, is created for the amoeba, which is illustrated by numerous text and plate figures. It would seem doubtful whether the evidence obtained from stained preparations made from a single stool of uncertain age is sufficient to justify the establishment of a new species and the numerous processes of development attributed to the amoeba.

C. M. W.

RODHAIN (J.) & VAN HOOFF (M. T.). Sur le pouvoir hématophage de *Entamoeba invadens*. [Ingestion of Red Blood Corpuscles by *E. invadens*.]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 26. pp. 138–141. With 1 fig.

Amoebae from cultures of *Entamoeba invadens* of snakes are capable of ingesting reptilian and human red blood corpuscles. As has been pointed out by GEIMAN and RATCLIFFE, this amoeba may also exhibit cannibalism.

C. M. W.

SIMICI (D.), POPESCO (M.) & COVACEANO (C.). Considérations sur l'importance sémiologique des épreuves Meltzer-Lyon et de Carnot et Gæhlinger pour la recherche de l'infestation du duodénum et des voies biliaires par les *Lamblias* intestinales. [The Meltzer-Lyon and the Carnot and Gæhlinger Tests in the Study of *Lamblia intestinalis* Infections.]—*Bull. Acad. Méd. Roumanie*. Bucharest. 1936. 1st Year. Vol. 2. No. 4. pp. 664–669.

Investigations by the duodenal sound of cases of lamblia infection submitted to the Meltzer-Lyon test appear to indicate that infection of the gall-bladder with the flagellate is of fairly common occurrence. If, however, the Carnot and Gæhlinger test is also applied the impression is gained that the increase of flagellates in the later samples

of bile from the duodenum is due rather to their detachment from the duodenal mucosa than to their expulsion from the gall bladder.

C. M. W.

VARGA (L.). Etudes sur la faune des protozoaires de quelques sols du Sahara et des hauts plateaux algériens.—*Ann. Inst. Pasteur*. 1936. Jan. Vol. 56. No. 1. pp. 101-123.

CORRESPONDENCE.

To the Editor of the Tropical Diseases Bulletin.

Sir,

In the March number of the *Tropical Diseases Bulletin* (p. 258) Dr. Hamilton FAIRLEY has commented on my use of the expression "Bengal splenomegaly."

I was not aware that I was introducing a new expression, as it is one that we have used in Calcutta for a number of years. Dr. M. N. DE, in 1932, in a paper in the *Indian Journal of Medical Research* (p. 1029), described 38 cases of a condition which he differentiated from kala azar, malaria, or any other splenomegaly of known aetiology and gave some important clinical and histological findings. He did not, however, report any study of the blood picture, and he avoided the term "Bengal splenomegaly", though it was in current use at the time. I have apparently blundered in where a wiser man feared to tread, and though I cannot claim the credit I must accept the responsibility.

Writing in an editorial capacity in the *Indian Medical Gazette* (May 1935), I anticipated Dr. Hamilton FAIRLEY's objection to the use of the words "Bengal splenomegaly."

"By a process of not very deep reasoning the term 'tropical splenomegaly' has been applied to conditions of splenic enlargement of unknown aetiology that occur in the tropics, and for the condition as it is encountered in Bengal the term 'Bengal splenomegaly' has been applied. By a similar process of argument the cases of enlarged spleen that occur in the Punjab might very well, and probably have been, referred to as 'Punjab splenomegaly.' It might be said that such multiplication of names is ridiculous, but we do not agree; both Bengal and the Punjab are tropical (or sub-tropical) countries but in some ways their climates are as different from one another as either is from the climate in Italy, for example; it is therefore possible that the aetiology of the splenic enlargements in these two countries is different, and it is as well to maintain the distinction until such time as the conditions are shown to be the same."

The case described by Dr. Hamilton FAIRLEY is undoubtedly very similar to the cases of macrocytic anaemia and splenomegaly which I reported and which are very common in Bengal, but he has not suggested a better name to cover both, and it seems to me that it will be as well to leave this choice of a name until we learn something more about the aetiology of this disease.

Yours etc.,

L. E. NAPIER, M.R.C.P. (Lond.).

The Calcutta School of Tropical Medicine,

Central Avenue, Calcutta.

11th May, 1937.

REVIEWS AND NOTICES.

TOUMANOFF (C.). *L'anophélisme en Extrême-Orient. Contribution faunistique et biologique.* [Anophelines in the Far East.]—Préface de E. ROUBAUD.—pp. viii + 434. With 75 figs. [164 refs.] Collection de la Société de Pathologie Exotique. Monographie IV. 1936. Paris: Masson et Cie, 120 Boulevard Saint-Germain. [60 fr.]

The book by Dr. Toumanoff on the *Anopheles* of the French territories in south-east Asia is the first comprehensive account of the subject which has been written; it is based upon his own field work, which apparently occupied about four years. During that time he travelled widely, especially in Tonking, and he also visited the northern part of Annam, including the country of the Laos, which is that part of Annam on the westward or inland side of the watershed; it is, therefore, in the basin of the Mekong river, adjacent to Siam.

In the first section of the text the author deals with systematics and geographical distribution. He records 18 species of *Anopheles* for Tonking, three of which had not been previously reported from any part of Indo-China, and several others not critically determined by previous authors. Among the notes on local distribution it is recorded that *A. minimus*, otherwise widely distributed and common, is exceedingly rare in the region of the delta (the author has not discussed whether this is perhaps due to the presence of silt in the water, as it seems to be in certain parts of Assam): *A. maculatus* and *maculipalpis* are also absent from the same region.

In the mountainous region the author has discovered the presence of *A. gigas* var. *baileyi* and *A. lindesayi*. Considerable attention is given to the area above 4,500 feet, which had not previously been investigated. In the north of Annam *A. culicifacies* was discovered; it has already been recorded from Siam, but is new for Indo-China. The author also presents much information about the seasonal abundance of adults and larvae in Tonking and Cochin China separately.

The second portion of the book deals with the biology of the adult and larval insects. The reader is impressed with the very large amount of detailed information on breeding places and on the resting habits of adults.

In the third section the author discusses the relation of species of *Anopheles* to malaria. His general conclusion, based on its relative abundance in houses, on precipitin tests, and on finding sporozoites, is that in nearly all parts of the area the most important carrier is *A. minimus*, which is found infected in houses up to 3 or 4 per cent. *Jeyporiensis*, *aconitus*, *maculatus* and *vagus* are also shown to be carriers in some parts of the area under discussion.

Though much remains to be done, the author is to be congratulated, not only on his fruitful work, but also on presenting it in a volume which is an important contribution to the subject. He concludes by summarizing what is known from the surrounding countries.

P. A. Buxton.

OTTOLENGHI (Donato). **Problemi igienici della bonifica integrale. Biblioteca della Bonifica Integrale.**—Vol. 12. pp. vii + 128. With 32 figs. [57 refs.] 1936. Florence : S. A. G. Barbèra.

In writing in English on the subject of *bonifica integrale*, one has always to surmount the difficulty of finding an adequate English translation of that phrase. Exception might well be taken to bonification, though the verb to bonify was once current in the English language. Bonification, however, has now become so familiar to readers of malaria literature that to suggest an alternative might cause confusion.

Professor Ottolenghi's volume is devoted to the public health aspects of the question ; it is the twelfth and last of a series of volumes dealing with every aspect of integral bonification. It is, perhaps, hardly necessary to remind the reader that integral bonification is much more than land reclamation, though it includes that. Its aims are much wider in scope than the ultimate elimination or control of the breeding places of anopheline vectors of malaria, though this is one of the most striking results of the successfully completed scheme. It includes all the measures necessary to transform waste-land, generally malarious, into a prosperous agricultural tract inhabited by a rural community enjoying all the amenities, hygienic, social and other, that the engineer, social worker and medical profession can supply in a well-ordered state.

Professor Ottolenghi is well qualified to deal with the health questions involved, and he has produced a clearly expressed and interesting volume, that is, to all intents and purposes, a text-book on rural hygiene. Housing is well treated, both temporary accommodation for the labour forces and the permanent buildings of the community receiving attention. Rural water supplies and refuse disposal are adequately discussed. The chapter on malaria is the longest and the best, a simple, precise and full exposition that should be most useful to the local health official with but little practical experience. Tuberculosis is dealt with briefly, as is infant mortality. The importance of the selection and supervision of the immigrant population and of the protection of the health of the resident population is discussed. The last chapter is concerned with the relevant legislation.

Norman White.

BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 34.]

1937.

TRYPANOSOMIASIS.

DEUTSCHMAN (S.). **Geographical Distribution of Human Trypanosomiasis in Africa.**—*League of Nations Epidemiol. Rep.* 1936. Oct.–Dec. Vol. 15. No. 10–12. pp. 201–218. With 2 maps. [14 refs.] [French version also.]

This paper records the present position as regards sleeping sickness in the various countries in tropical Africa; the statements are based on recent official reports, mainly those of 1935, but failing them on those of 1934. All this information is summarized in a table.

In French West Africa (Sudan, Niger, Ivory Coast, Dahomey and Guinea) the total number of persons examined during 1934 was 916,393; amongst these 25,030 new cases and 25,518 old cases of sleeping sickness were found. The figures for each of the various countries are given in a table.

In the Gold Coast, the number of sleeping sickness cases treated in hospitals and dispensaries is constantly rising. In 1929–30, sleeping sickness patients amounted to 6·6 per 100,000 cases treated; 33·1 in 1932–33, 91·3 in 1934, and 177·8 (3,885 cases) in 1935. The author states that this enormous increase is very largely explained by the fact that treatment is becoming popular, and by the change in the attitude of the natives.

In the Gambia, 1,106 cases with 32 deaths were recorded in 1935. In Sierra Leone, 4 cases were treated in 1934 and 4 also in 1935. In Portuguese Guinea a sleeping sickness mission in 1932 discovered 18 cases.

In Nigeria, 6 sleeping sickness units, each consisting of a medical officer, 2 native nurses and 18 to 24 native dispensary attendants, operated in 1934. They examined 381,712 persons and discovered 43,017 cases, of which less than 600 had been treated previously. Furthermore, 4,613 cases were treated in dispensaries and hospitals of the Colony. The distribution of these cases throughout Nigeria is shown in a table.

The activities of the sleeping sickness surveys between 1922 and 1935 in the Cameroons under French mandate are summarized in a table. At the end of 1935, out of 146,116 cases discovered at various dates since 1920, 39,150 had died. In 1935 the number of persons examined was 557,327 and among these 3,614 new cases of the disease were found.

The results of the sleeping sickness campaign in French Equatorial Africa between 1924 and 1934 are shown in a table. In 1934, the number of persons examined was 1,440,676 and 42,508 old cases were seen and treated, and 13,368 new cases discovered. No fewer than 41,000 lumbar punctures were performed.

The activity of the sleeping sickness service in the Belgian Congo between 1927 and 1935 is summarized in a table. In 1935, 4,356,270 persons were examined, and 66,775 old cases were kept under observation, and 18,930 new cases discovered.

Another table shows the number of cases of the disease recorded in Uganda from 1931 to 1935; in the last year there were 675 cases with 72 deaths. In Kenya 15 cases were discovered in 1935. The number of cases discovered in Tanganyika each year between 1931 and 1935 is shown in a table. In 1935 there were 1,075 cases and 342 deaths. In Portuguese East Africa, 28 cases were recorded during 1935; in Northern Rhodesia, 50 cases, none in Southern Rhodesia and 2 in Nyasaland.

In Bechuanaland the first 2 cases were recorded in 1934. In Angola the cases reported in 1935 were distributed as follows:—1,232 (24 deaths) in the coastal districts, 12 (1 death) in the districts adjoining the border, and 198 (14 deaths) in those of the interior. In Spanish Guinea the presence of the disease is reported in the island of Fernando Po and on the continent. The epidemic area, which, up to 1925, was limited to the Coast, has since invaded the whole continental area of the Colony.

As the result of this summary the author draws the following conclusions:—

"In the African territories situated between the tropics, the total population of which may be estimated at 65 millions, nearly 7 millions were examined in the course of a single year. 140,000 fresh cases were discovered and treated, besides a similar number of old cases.

"In territories where the campaign has been going on for a long time (Belgian Congo, French Equatorial Africa, Cameroons under French mandate), out of nearly 15 million inhabitants, the number examined in the course of a year exceeds 6 millions.

"Recent surveys carried out in colonies west of the Cameroons show that sleeping-sickness holds a more important place among diseases in West Africa than was supposed hitherto.

"In certain endemic areas such as those of Kwango in the Belgian Congo, Nola in the Middle Congo, Abong M'bang in the Cameroons, and Djouah in Togoland, the results obtained from a ceaseless campaign do not yet permit us to foresee an early eradication of the disease.

"Agricultural prophylaxis, the importance of which is paramount, is still at a rudimentary stage. In certain areas where it has been put into practice, it gives encouraging local results. It meets, however, with considerable economic and administrative difficulties."

W. Yorke.

LESTER (H. M. O.). **Report of the Tsetse Investigation and Sleeping Sickness Service.**—*Nigeria Ann. Rep. Med. Services 1935.* Appendix B. pp. 71–76.

During the year, 407,203 people were examined at surveys in the field and 84,364 were found to be suffering from trypanosomiasis. Altogether 87,369 cases were treated by the teams; this number included 4,000 patients who were diagnosed at the end of 1934. As no

re-surveys were carried out during the year practically all these patients were new cases. A further 4,358 patients were treated at field dispensaries and 4,825 at general medical stations, making a grand total of 96,552 cases of sleeping sickness treated during the year.

In spite of intensive campaigns of mass treatment and the establishment of sleeping sickness dispensaries, the disease is not yet under control. New areas are becoming infected and the type of disease in some of the older epidemics is becoming worse.

As a result of a Conference held at Kaduna on 27th November, 1935, a scheme was drawn up as a five years' plan to be reviewed towards the end of that period. It provides for (a) improved organization of the sleeping sickness teams to include the appointment of a number of R.A.M.C. British Non-Commissioned Officers to supervise the teams in the field and relieve the strain on the medical staff, (b) staff to advise upon protective clearings and to supervise such work, and (c) staff and funds to organize and carry out concentration of population in certain districts. The Emir of Zaria was consulted with regard to the movement and concentration of population.

The research work carried out during the year on the testing of new chemical compounds took a prominent place. The investigation of the action of Surfen C on trypanosomiasis of cattle was transferred to the Veterinary Department, and this work is now being done at Vom. Preparations 6210, 6558, 5547 and 6690 supplied by the Bayer Company were tested against *T. vivax* in sheep. None of these preparations proved to be as effective as Surfen C.

The following compounds have been tested in man, viz., S.107 supplied by the Chemotherapy Committee of the Medical Research Council, and Sdt.386B, 411 and 471 (antimonials) supplied by the Bayer Company, and Dn.18 (an antimonial) supplied by the Union Chimique Belge.

Experiments on the effect of exposing "premunized" animals to fresh infections, which were started in 1934, have been continued. It was found that although previous injections had given cattle some degree of resistance this was not sufficient to influence the mortality when the cattle were exposed to *G. submorsitans* in the bush. Dr. NASH, the Entomologist, has continued his researches, and one or two papers have been published by him during the year.

Writing on the therapeutic measures adopted during the year, Lester states that almost all field cases had been given a standard form of treatment, consisting of three one-gram doses of Antrypol or Bayer 205, followed by five two-gram doses of tryparsamide. From the point of view of amelioration of symptoms this form of treatment appeared to be as good as the longer course of tryparsamide. It is more effective in that both Bayer and Antrypol have a greater trypanocidal action than tryparsamide, so that relapses are less likely to occur. As the course of treatment is shorter it is much more popular with the community. Reference is made to certain untoward consequences of the administration of Bayer and Antrypol. These are vomiting, especially after the dose is injected too quickly, occasional transient oedema and rash, and mild peripheral neuritis. Unfortunately, a small number of alarming cases of collapse have occurred both after Antrypol and Bayer; three of these patients died.

The report concludes with observations on the work of the dispensaries, the treatment of mines labour, and protective measures.

W. Y.

LAMBORN (W. A.). **Report on the Incidence of Sleeping Sickness in Ngamiland, Bechuanaland Protectorate.**—*Bechuanaland Protectorate Ann. Med. & San. Rep. Year 1935.* Appendix B. pp. 36–52.

The author was lent to the Bechuanaland Government by Nyasaland in order that he might examine the instance of sleeping sickness in the Okovango swamps in Ngamiland and formulate recommendations for the control of the disease. Although the occurrence of sleeping sickness in this fly area had been disputed for many years, it was not until November 1935, that two definite cases of sleeping sickness were reported by Dr. MacKenzie. Lamborn gives the following summary of his observations and conclusions:—

“ Every native living in the villages situated in the southern fly area, and those bordering it, a total of 258, were medically examined. There was an entire absence of the signs and symptoms of Sleeping Sickness and all the blood films proved negative.

“ It is doubtful whether Sleeping Sickness has ever occurred in this area. Four cases considered by the natives to be ‘ Kgotsella ’ were certainly not Sleeping Sickness.

“ All natives living in the northern fly area or near it, a total of 186, were medically examined ; again without result and all the blood films were negative.

“ Evidence showing that a minor epidemic in which thirteen bushmen recently lost their lives, almost certainly from Sleeping Sickness, was obtained, and it must have been in their village that the two police constables became infected.

“ Though the epidemic is at an end it is recommended that the population in this northern area should be removed and settled in a fly free neighbourhood from which many originally came, steps being taken to guard against their return.

“ The wanderings of bushmen through both fly areas should be terminated.

“ The Administration of South West Africa should be invited not only to take steps to ascertain the position as regards tsetse and Sleeping Sickness in the Caprivi Strip ; but should be asked to co-operate with a view to preventing natives in it coming into the fly areas of this country.

“ Control of the movements of the bushmen is also called for, since, owing to their predilection for the fly areas as hunting grounds, they are more likely than natives of other tribes to become infected and by their nomadic habits to spread infection far and wide, as might well have been the case in the present instance. Headmen might well be instructed to report the presence of bands of them, which should be relegated to the region south of the Kasane-Maun-Tsao-Nokaneng road, pressure being brought to bear on them if they returned.

“ The tendency of natives to proceed into fly areas in search of foodstuffs such as the pith of the wild date palms, the corns of papyrus and various roots might well be checked if they could be induced to cultivate some alternatives to the millet or maize, which in the areas I visited seem to be their sole crops, and which are said often to fail from failure of the rainfall or from locusts, as seems to have been the case in the present year. Rice, for instance could be grown, I feel sure, in almost unlimited quantities in the swamp areas : yet seems to be quite unknown. The foundations for a flourishing export trade to the Union when internal communications are improved might well be laid if natives could be induced to cultivate this cereal.

“ Varieties of the sweet potato, too, could certainly be grown in moist land at the edge of the swamp, as it is grown round Lake Nyasa, at a season when the season for cereals is over ; and the cultivation of cassava in the sandy soil must offer possibilities.”

W. Y.

CONGO BELGE : RAPPORT SUR L'HYGIÈNE PUBLIQUE AU CONGO BELGE PENDANT L'ANNÉE 1935 [VAN HOOF (L.)]. [*Trypanosomiasis* pp. 27-42. With 1 map.]

In this report the position of sleeping sickness in the various parts of the Belgian Congo is summarized. During the year 6 Europeans have been found to be infected, 4 in the province of Leopoldville, 1 in that of Lusambo, and 1 in Elisabethville. In a table the number of people examined, the number of old cases kept under observation, the number of new cases discovered and the index of new infection are given for each of the years 1927 to 1935. In 1935, 4,356,270 persons were examined, 66,774 old cases kept under observation, 18,930 new cases discovered, and the index of new infection was 0.43 per cent. Another table summarizes these data in respect of each of the Provinces, *viz.*, Leopoldville, Lusambo, Coquilhatville, Stanleyville, Costermansville and Elisabethville. A brief account of the present state of affairs in each of these provinces follows. W. Y.

VLEURINCK. Rapport concernant l'influence du chemin de fer sur la dissémination des glossines au Katanga. [*Report on the Influence of the Railway in disseminating Glossina in Katanga.*]—*Bull. Méd. du Katanga*. 1936. Vol. 13. No. 3. pp. 104-5, 107-13. With 1 map.

This investigation was conducted in order to ascertain how far the railway disseminated *Glossina*, and in particular whether it is conveying infected *Glossina* from Malondo to the agricultural regions around Elisabethville. A systematic examination of the trains from the north was made at Lubudi station from 17 April to 7 May, 1935; this period is at the beginning of the rains when tsetse are most common. During the 21 days 19 trains reached Lubudi from the north and only 12 tsetse (*G. morsitans*) were found.

The author describes how on one occasion he made a journey by trolley from Simbala to Kalule accompanied by 4 natives, 2 of whom pushed the trolley and 2 sat by him. Tsetse were particularly numerous and there were always at least 50 around them. The boys amused themselves by catching them and putting them in a heap in front of the trolley in order that they might have the pleasure of hearing them crushed. During the 45 minutes journey at least 300 flies were destroyed in this way. Vleurinck was informed that this was a usual pastime with the trolley boys. He does not see in this procedure a way of exterminating the fly, but he contends that the railway destroys a hundred times more flies than it transports. His general conclusion is that the railway does not constitute a serious danger for the transportation of infected tsetse. W. Y.

STEWART (J. L.). *Porcine Trypanosomiasis in the Gold Coast.*—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 313-314.

Owing to the fact that the pig population of the Gold Coast is largely in the forest where no veterinary staff is stationed, trypanosomiasis has only recently been diagnosed in them. A few years ago *T. brucei* was found in grade pigs in the Northern Territories, and this year *T. simiae* has been found for the first time in West Africa in a flock of swine near Kumasi.

An excellent opportunity for observing the effects of *T. brucei* infection appeared in 1934, when 17 cases occurred amongst grade pigs at Pong-Tamale Farm. The symptoms were characteristic—inappetence and weakness of the hindquarters, followed by chronic progressive anaemia; the temperatures were normal and trypanosomes in small numbers were present in the blood.

The epidemic, due to *T. simiae*, was apparently severe, as a Syrian, who owned a herd of about 150 head of mixed grade Yorkshire and native pigs, lost 100 in a few weeks from a sudden fatal disease. From the history it would appear probable that no symptoms occur in infected pigs until the infection reaches a very high degree of intensity (trypanosomes are said to be swarming in the blood) and then the animal dies of an acute septicaemia in much the same way that anthrax affects cattle.

W. Y.

HOARE (Cecil A.). **Note on *Trypanosoma simiae* from an Outbreak amongst Pigs in the Gold Coast.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 315–316. With 7 figs.

Hoare had an opportunity of examining blood films sent to him by Stewart from pigs infected with *T. simiae* at Kumasi. After giving a brief account of the morphology of the parasite Hoare writes:—

“It is thus seen that both qualitatively and quantitatively *T. simiae* from the Gold Coast pigs reveals the same features as the other strains of this trypanosome described by me. This fact provides further evidence that the polymorphism of *T. simiae* is not due to mixed infections, but represents a constant characteristic of this species.”

W. Y.

HORNBY (H. E.). **Trypanosomiasis of Pigs due to *Trypanosoma simiae*.**—*Tanganyika Territory Ann. Rep. Dept. Vet. Sci. & Animal Husbandry* 1935. pp. 43–48. With 2 figs. on 1 plate.

The author gives an account of the trypanosome found producing an acute disease in pigs in Tanganyika Territory. He summarizes his observations as follows:—

“Outbreaks of acute porcine trypanosomiasis occur from time to time in Tanganyika Territory.

“The course of the disease is extremely rapid; death may occur within a week of infection and after only a few hours visible illness. During this time of visible illness trypanosomes are usually extremely abundant in the blood.

“The appearance of these trypanosomes varies. In some cases they closely resemble *T. congolense*, but in many other cases the majority are dividing so rapidly that they appear to be in a state of multiple, rather than the ordinary binary, fission. The single individuals in these cases vary much in appearance; some resembling *T. congolense*, that is fairly broad and with little or no free flagellum; some being much thinner than these with a definite free flagellum, and some intermediate between these extremes. When, however, sub-inoculations are made from the pig to the sheep, only *T. congolense*-like parasites may be expected to appear. A careful study of these sheep forms brings them definitely into line with *T. simiae*, described by Bruce *et al.* in 1914. It would appear, however, that these workers overlooked the peculiar forms into which *T. simiae* often divides when multiplying at an enormous rate in the pig.

"It is these unusual forms which have led to much misunderstanding concerning the species. They have been described by Walravens as constituting a new species, *T. rodhaini*, but this name should now disappear.

"In experiments at Mpwapwa, a calf was found to be refractory to infection, and only very transient infection was set up in the rabbit and guineapig. Sheep were infected easily, and a disease almost indistinguishable from that of *T. congolense* set up. As, however, a characteristic of *T. simiae* is the rapidity with which its pathogenicity is modified by passage, it was not surprising that after only a few passages the strain died out in its laboratory hosts and was lost.

"On epizootiological grounds it is almost certain that outbreaks in herds of pigs are initiated by a tsetse fly, but that spread within the herd is through mechanical transmission by flies other than tsetse. For this reason, if the disease appears, the pigs should be divided into as many small groups as it is possible to keep separate, and thus mechanical transmission will be checked."

W. Y.

ADAMS (A. R. D.). **Trypanosomiasis of Stock in Mauritius. III. The Diagnosis and Course of Untreated *T. vivax* Infections in Domestic Animals.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 521–531.

In this paper Adams continues his interesting studies of *T. vivax* infections of stock in Mauritius. He gives the following summary of his work :—

"1. Two strains of Mauritian *T. vivax* were maintained in ruminants by subcutaneous inoculation of small quantities of blood from animal to animal.

"2. The experimental animals were segregated and kept in a number of efficiently fly-proofed stables under good conditions of maintenance.

"3. Sheep were found to be highly susceptible to the infection. Four animals died of acute trypanosomiasis inside a period ranging from two weeks to two months after the infecting inoculation.

"4. Goats were also highly susceptible and died in the majority of cases from the disease in a similar period. Some few, however, survived the immediate effects, and appeared to develop a considerable tolerance to the parasite.

"5. Cattle were readily infected, but proved relatively resistant to the effects of infection. All developed a high degree of tolerance-immunity after some weeks of subacute febrile disturbance.

"6. Pigs proved refractory to infection, as were all the ordinary smaller laboratory animals.

"7. Attempted superinfection of two cattle with either a homologous or a heterologous strain of the same parasite failed to produce any apparent result.

"8. Gland puncture was explored as a method of diagnosis of the experimental infections in cattle, sheep and goats. It was found that on occasion trypanosomes were recovered 24 or 48 hours earlier in the gland juices than in the peripheral blood of these animals.

"9. In sheep and goats which eventually died from acute or subacute trypanosomiasis, gland puncture did not prove superior to blood examination as a diagnostic technique. In several instances it was inferior both in regard to the frequency of positive results and in the numerical concentration of parasites.

"10. In cattle, trypanosomes were frequently present in the pre-scapular glands in greater concentration than in the peripheral blood during the first few weeks of the subacute stage of the infection. After this, each method gave closely similar findings. In certain cases

trypanosomes were found in considerable numbers in both the blood and gland juices, after being absent for very prolonged intervals, as a result of lowering of the general resistance by accidental injuries.

" 11. Neither gland puncture nor peripheral blood examination is an efficient method of excluding a latent or chronic *T. vivax* infection in ruminants.

" 12. It is suggested that the administration of some drug, such as histamine, to produce severe systemic shock, might profitably be employed to break down temporarily the balance existing between trypanosome and mammalian host and to reveal such latent infections. These cryptic infections have been shown to persist certainly for many months and probably for years, and are of very considerable importance in that they constitute a hidden reservoir of infection in epizootic or enzootic areas."

W. Y.

DUKE (H. Lyndhurst). **Some Recent Advances in the Biology of Trypanosomes of Sleeping-Sickness.**—*League of Nations Epidemiol. Rep.* 1936. Oct.-Dec. Vol. 15. No. 10-12. pp. 187-200. [25 refs.] [French version also.]

In this article Duke gives a semi-popular review of recent work on human trypanosomiasis. He deals with such subjects as: The factors which influence the development of trypanosomes in *Glossina*; arsenic-resistance; man's resistance to trypanosomes of the *brucei* group; behaviour of man's trypanosomes in animals; and the origin of *T. rhodesiense*. As all these matters have already been fully discussed by Duke in previous papers no further notice is required in this *Bulletin*.

The following are Duke's conclusions:—

" In spite of the uncertainty that still surrounds some of the major problems of human trypanosomiasis, there are, nevertheless, certain clear indications to direct those called upon to administer the infected territories in Africa.

" One thing is clear: man must be protected, not only from *G. palpalis*, but also from game-feeding tsetse.

" In *palpalis* areas, the control of sleeping-sickness, although a matter of enormous difficulty and expense, is simply a question of breaking contact between tsetse and man. The enormous numbers of people affected and the diffuse distribution of this tsetse along countless streams and rivers are the main obstacles to success.

" In game-tsetse areas, the problem, though still difficult, is in some ways not so complex, for the population affected is nothing like so extensive. There is, however, an added danger in the tendency of certain of the game tsetses to spread to settled areas.

" Human settlement in game country must be protected from game tsetse. Game alone, apart from its bad effect on stock and food crops, is not harmful, save in as much as it may attract tsetse.

" Where settlement is necessary in game-tsetse areas, the game must be exterminated as part of the measures to ensure protection of the population against game tsetses.

" Isolated settlements in areas mainly given over to tsetse supply just the conditions that favour the appearance of *T. rhodesiense*.

" Settlements in the vicinity of game tsetse should be under a form of supervision by which the natives are enabled to co-operate with the authorities to ensure their own protection. Experience in the Congo, in Tanganyika and the Southern Sudan has shown how much can be effected by judicious concentration of scattered settlements in the campaign against tsetse.

" There is still, and will be for many years to come, plenty of room in Africa for both natives and game. But compromise is dangerous. Native interests must be paramount. Game, as a valuable and irreplaceable asset to the territories where it occurs, must be preserved wherever possible.

" There is danger in indiscriminate preservation, just as there is danger in the indiscriminate destruction of wild game. Game-preserves must be properly defined and measures must be devised to supervise visitors, black and white, who are liable to exposure to tsetse. In the meantime, the value of Bayer 205 as a prophylactic against infection may be borne in mind.

" At the present day in Africa, owing to the operation of causes such as denudation, reckless and improvident native agricultural methods and lack of water-supplies, there are large areas that are derelict and given over to scrub and tsetse and game. The soil is so exhausted that settlement is only possible under great hardship and privation.

" Simultaneously with measures to ensure breach of contact between population and tsetse, there must be the organisation of the resources of the territories to ensure proper agricultural development, and to control the appalling destruction of soil values proceeding day by day over huge areas in Central Africa, and due, in the last analysis, to the inadequate conservation and control of rain-water.

" Endemic sleeping-sickness is a disease associated with poverty—inadequate food, poor physique, low resistance and standards of living. And such are the penalties attaching to life in fly-country.

" Improve the native's standard of living and teach him the elements of sanitation, and the admirable results attained in the Sudan, in the Belgian Congo and in Tanganyika will follow in due course. With modern remedies, the disease has lost many of its terrors for the European. But it is still a serious menace to human life in many a remote territory in the central zone of Africa, as may be seen in the distribution tables following this article.

" Unfortunately, expenditure on the control of sleeping-sickness often promises little or no direct economic return. But it is imposed upon us Europeans as part of an heritage of responsibility, into whose hands have been given the lives and well-being of hundreds of thousands of ignorant and helpless natives.

" We must remember that the opening-up of the continent during the last thirty years or so has facilitated the spread of human trypanosomiasis. Let us then acknowledge our obligations and vigorously continue the campaign until sleeping-sickness is no longer a major scourge, or even a remote menace to man in Africa."

W. Y.

DUKE (H. Lyndhurst). Recent Observations on the Biology of the Trypanosomes of Man in Africa.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 275–296. [42 refs.] Discussion pp. 297–308.

In this address to the Royal Society of Tropical Medicine, Duke presents the results of nearly 25 years of almost continuous work on the study of trypanosomiasis. Under these circumstances, it is not surprising that he covers a vast field.

The first portion of the Address is concerned with the factors which may influence the adaptation of man's trypanosomes to tsetse; the second portion deals with the subject of arsenic-resistance; the third portion is concerned with the power of trypanosomes of the *brucei* group to infect man; the fourth portion with the behaviour of man's trypanosomes in animals, and the fifth portion with the origin of *T.*

rhodesiense and the rôle of the game in the spread of human trypanosomiasis.

All the observations on which Duke bases his arguments have already been published elsewhere and have been noticed in this *Bulletin*. The present paper, which is of great interest, cannot be adequately summarized and must be consulted in the original.

Duke, in his introductory remarks, said that the success of his paper would be measured by the discussion it provoked. On this criterion Duke must be well satisfied, because his paper was followed by a long and animated discussion in which the reviewer, Muriel Robertson, Chesterman, Davey, Johnson, Hoare, Brown, Buxton, and the President took part. W. Y.

DUKE (H. Lyndhurst). **Studies of the Effect on *T. gambiense* and *T. rhodesiense* of Prolonged Maintenance in Mammals other than Man : with Special Reference to the Power of these Trypanosomes to Infect Man. V. The Effect of Prolonged Maintenance away from Man on the Infectivity of *T. rhodesiense* for Man.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 12-34. [15 refs.]

The author's earlier investigations on this subject have already been published [this *Bulletin*, 1935, Vol. 32, pp. 688, 690]. In the present paper, five strains are dealt with, three of them, Tinde I, II, and III, have already formed the subject of the previous communications, whilst the other two, KB and KH, were received from Tanganyika at the end of 1934. A full description of the manner of maintenance of each of these strains and of the tests made with them is given.

In summing up his observations, Duke states that it is with some reluctance that he now attempts to draw general conclusions from them, but the closure of the Institute makes it necessary to produce some kind of general summary. This he does in the following words :—

" (1) *T. rhodesiense* may survive in antelope for at least 2½ years in a form transmissible by tsetse.

" (2) Strains of *T. rhodesiense* differ in their adaptability to antelope.

" (3) Individual antelope react differently to the same strain; some throw off infection more quickly than others. There is some evidence to show that of the four species examined, bushbuck and reedbuck are better suited to requirements of the trypanosome than oribi and situtunga.

" (4) Strains of *T. rhodesiense* differ in their power to infect man; some lose this power more readily than others.

" (5) There is reason to believe that with strains whose pathogenicity to man is neither very stable nor pronounced, the inoculation of the blood forms of the trypanosome is more likely to produce infection in man than the introduction of metacyclic forms by the bite of an infective tsetse.

" (6) Some new evidence has been brought forward that flies infected from an antelope carrying *T. rhodesiense* may fail to infect man, whereas flies infected from a monkey that has been infected by an inoculation of the same antelope's blood may infect man.

" (7) A study of all the results obtained during the last few years at Entebbe leads me to conclude that although an antelope may remain infected with *T. rhodesiense* for a year or two, there is a definite tendency for the trypanosome in these circumstances to lose its infectivity for man. An important point is this. Although a trypanosome after long residence in antelope, when isolated in laboratory animals and tested from time to time in man, may infect all or the majority of the volunteers employed, nevertheless when the tests are performed by means of flies infected from the antelope itself the results on man may be very irregular. This

irregularity cannot be explained by the failure of the flies actually to bite the volunteer.

"(8) After a time, varying according to the individual and species of animal from a few months to more than 2 years, *T. rhodesiense* appears to die out in the blood of antelope. Such an animal is, however, susceptible to reinfection with another strain of *T. rhodesiense*, a very short time after the disappearance of the first infection. This suggests that immunity may gradually be established in an antelope repeatedly exposed to infection.

"Whether an antelope ever becomes *permanently* immune against *all* strains of *T. rhodesiense* has not been determined, but it appears likely that this process will be slow.

"(9) Interesting results have followed the testing on man of the trypanosome in the reinfected antelope. This has been done with one bushbuck and two reedbuck. In each test several flies with heavy gland infections were proved (by dissection and finding blood corpuscles) to have bitten clean volunteers. The reinfection strain in the bushbuck failed to infect man; those of the two reedbuck succeeded.

"It was found some years ago with sheep and goats that a prolonged infection with *T. gambiense* resulted in the reduction or complete loss of the transmissibility of the strain in that animal. If, after this had happened the animal was then superinfected with another and readily transmissible strain, and the trypanosomes in the superinfected animal were examined one month or so later, their transmissibility by tsetse was either much reduced or lost.

"The reinfection experiment with bushbuck III reveals similar features. The transmissibility of the reinfected strains was, it is true, unimpaired—we know now that *T. rhodesiense* is much better adapted to life in antelope than *T. gambiense*—but the partially immunized animal in this case has apparently exerted an effect on another physiological quality of the trypanosome, viz. its pathogenicity to man, as tested in two volunteers.

"(10) A spotted hyaena (*Crocuta crocuta germinans* Matschie) was infected with *T. rhodesiense*. Two years later the animal appeared to be in excellent health, never having manifested any symptoms of illness. 569 days after its first infection trypanosomes were isolated from this hyaena and found on frequent tests to be regularly pathogenic to man.

"(11) Prolonged maintenance of *T. rhodesiense* in guinea-pigs has been found on several different occasions to lead to impairment of the pathogenicity of the strain for man."

W. Y.

DUKE (H. Lyndhurst). **Studies of the Effect on *T. gambiense* and *T. rhodesiense* of Prolonged Maintenance in Mammals other than Man: with Special Reference to the Power of these Trypanosomes to Infect Man. VI. Strain "Kahondera" from Southern Rhodesia, and Concluding Observations on this Series of Papers.—***Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 35–42.

This paper, which was the last to be published from the Uganda Institute, gives an account of Strain Kahondera from Southern Rhodesia, and this is followed by a brief discussion of the origin of *T. rhodesiense*.

A Kahondera strain was isolated from a native of Gowe in the Hartley-Sebungwe area of Southern Rhodesia. Kahondera was one of three infected natives detected by Dr. BLAIR during an exhaustive survey of the area. The Gowe settlement coincided with one of the said areas depicted on the tsetse maps of the Protectorate and called by JACK "residual foci," where tsetse survived the great rinderpest outbreak of 1896.

The conditions at Gowe were therefore peculiarly favourable to the development of a human strain of *T. brucei*, for man had there been in contact with the fly and trypanosome for many years. After giving a description of the morphology, pathogenicity and the reaction to arsenicals of this trypanosome, Duke passes to a consideration of its identity: is it *T. gambiense* or *T. rhodesiense*? When first isolated from man the trypanosome was only moderately virulent in laboratory animals, but on passage its virulence increased. The strain was very much more resistant to arsenic than typical *T. gambiense*. Posterior-nuclear forms were rarely encountered. Apparently, then, the trypanosome possesses some of the characters of *T. gambiense* and some of *T. rhodesiense*, but in Duke's opinion the evidence points rather to *T. rhodesiense*. W. Y.

BRUTSAERT (P.) & HENRARD (C.). La culture des trypanosomes pathogènes. Résumé. [Cultivation of the Pathogenic Trypanosomes.]—*Ann. Soc. Belge de Méd. Trop.* 1936. Dec. 31. Vol. 16. No. 4. pp. 479-481.

In their attempts to culture the pathogenic trypanosomes, the authors used 5 different media of the following compositions:—

- i. Equal parts of citrated human blood and Ringer solution containing 0.6 per cent. NaCl.
- ii. Equal parts of citrated human blood and Locke's solution.
- iii. Medium i to which was added 0.5 gm. per litre of cholesterol.
- iv. Medium i to which was added 10 gm. of Witte's peptone and 10 gm. of Coignet's gelatine (gold medal).
- v. Citrated human blood and Thyrode's solution.

The following table gives the principal results obtained in course of 16 experiments with 6 strains of *T. gambiense*, 1 strain of *T. brucei* and 3 of *T. congolense*:—

Strain of trypanosomes	Date of commencement of culture	Number of sub-cultures	Number of days	Observations
<i>T. gambiense</i> ... Gangwele 4	12.7.35	49	428	The same strain as the previous passed through a monkey-fly-guineapig
<i>T. gambiense</i> ... Gangwele 4 from guineapig 239	3.4.36	19	161	
<i>T. gambiense</i> ... from guineapig 412	13.3.36	23	182	
<i>T. brucei</i> ... strain (from Pr. Schilling of Berlin) from guineapig 398	18.2.36	24	206	
<i>T. congolense</i> ... Stanleyville from guineapig 272	8.10.35	36	339	

The best results were obtained with Medium iii and the next best with Media i and v. REICHENOW showed that old laboratory strains of

trypanosomes cultured less easily than recently isolated strains [this *Bulletin*, 1933, Vol. 30, p. 118]. The authors found that non-transmissible strains could not be cultured; but, on the other hand, they also failed with certain strains which were readily transmissible by *Glossina*.

In order to ascertain whether the culture forms would infect *Glossina*, Brutsaert and Henrard fed 51 *G. palpalis* on cultures of *T. gambiense* and found 4 "gut" infections and 1 "gut + proventriculus" infection; 25 tsetse were fed on *T. congolense* cultures and 1 "gut" infection was obtained. It is also interesting to note that 2 goats were infected with *T. congolense* after it had been cultured for 156 days. W. Y.

HOARE (Cecil A.) & BENNETT (S. C. J.). **Morphological and Taxonomic Studies on Mammalian Trypanosomes. III. Spontaneous Occurrence of Strains of *Trypanosoma evansi* Devoid of the Kinetonucleus.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 43-56. With 1 map & 7 figs. [21 refs.]

An account is given of the spontaneous occurrence of strains devoid of a kinetonucleus in *T. evansi* from the Anglo-Egyptian Sudan. Four of these strains are recorded, and were discovered in widely separated localities within the enzootic area of camel trypanosomiasis.

A critical review is given of the question of "akinetonucleate" trypanosomes in general. While the factors causing the appearance of "akinetonucleate" individuals and strains under natural conditions could not be ascertained, irregular division of the trypanosomes is held to be mainly responsible for the elimination of the kinetonucleus and for the persistence of the aberrant condition. W. Y.

MURGATROYD (F.) & YORKE (Warrington) with an Appendix by J. F. CORSON. **Studies in Chemotherapy. XIII.—The Changes observed in *T. brucei* during Five Years' Maintenance in the Laboratory.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 145-163.

The object of this work was to learn something of the changes which occurred in a strain of trypanosomes during prolonged maintenance by various methods in a European laboratory. The investigation commenced in August 1931, when a strain of *T. brucei* recently isolated from wild *G. morsitans* in Uganda was sent to this country in guinea-pigs. The authors summarize their observations as follows:—

"1. In view of the well-established fact that arsenicals are of little use in the treatment of human beings suffering from *rhodesiense* sleeping sickness, the extreme sensitiveness to these drugs of our old laboratory strain of *T. rhodesiense* in mice was very surprising.

"2. Three strains of *T. rhodesiense* were obtained from recently diagnosed and untreated Tanganyika cases of sleeping sickness. These strains in mice of the first passage proved refractory to arsenical treatment, but in mice of later passages were definitely more susceptible.

"3. These observations caused us to investigate experimentally the changes experienced by a trypanosome during its maintenance in the laboratory. The trypanosome used was *T. brucei* recently isolated from wild fly in Uganda. This parasite was maintained in four different ways during a period of 5½ years, and the changes were carefully observed. The characters considered were morphology, pathogenicity, susceptibility to arsenicals and transmissibility by *G. morsitans*.

"4. It was found that all the four strains underwent modifications, but that those of the strains passaged through mice were much more rapid and pronounced than those of the strains passaged through guinea-pigs.

"5. The mouse-passage strains exhibited changes of morphology; greatly increased pathogenicity for mice and greatly decreased pathogenicity for guinea-pigs; greatly increased sensitiveness to arsenicals; and loss of transmissibility by *G. morsitans*.

"The guinea-pig-passage strains exhibited no change of morphology; they showed a gradual increase in pathogenicity for guinea-pigs and mice, and eventually a marked increase in sensitiveness to arsenicals, but this last change appeared more slowly than in the mouse-passage strains. These strains likewise finally lost their capacity of being transmitted by *Glossina*, but it must be noted that this character persisted for 4 years in Strain 3, which was passed from time to time through *Glossina*. So long as this strain remained transmissible by *Glossina*, its original characters appeared to be preserved practically unchanged.

"6. A fifth strain which was made arsenic-resistant and passed through guinea-pigs, partly by blood inoculation and partly by *G. morsitans*, behaved in exactly the same way as the corresponding normal variety, except that its acquired character of arsenic-resistance was maintained unimpaired.

"We were unable to obtain any support for the hypothesis that the rendering of a trypanosome arsenic-resistant interferes with its capacity to develop in *Glossina*." W. Y.

MURGATROYD (F.) & YORKE (Warrington). **Studies in Chemotherapy.**

XIV.—The Stability of Drug-Resistance in Trypanosomes.—
Ann. Trop. Med. & Parasit. 1937. Apr. 8. Vol. 31. No. 1.
pp. 165–172.

In this paper the authors consider the duration of the acquired character of drug-resistance in trypanosomes. Two main problems were investigated: firstly, how long resistance to various drugs persisted in trypanosomes passaged through mice by blood inoculation, and, secondly, whether the resistance survived the developmental cycle of the trypanosome in *Glossina*. The following are the conclusions:—

"Resistance to the aromatic compounds of arsenic and antimony and to acriflavine is rapidly acquired by trypanosomes and persists indefinitely. A strain of *T. rhodesiense* made resistant to atoxyl in 1929, and subsequently passaged through mice by blood inoculation, has maintained unimpaired its resistant character for a period of 7½ years, during which the strain has passed through a series of 900 mice. Strains of *T. rhodesiense* made resistant to tryparsamide and to acriflavine respectively behaved similarly.

"Resistance to the aromatic arsenicals likewise survives unimpaired when the trypanosome is passed repeatedly through the natural intermediate host, *Glossina*. A strain of *T. brucei* made resistant to tryparsamide in 1932, and subsequently transmitted through guinea-pigs, partly by blood inoculation and partly by the tsetse-fly, has maintained unimpaired its resistant character for a period of 4 years, during which it has passed through 59 guinea-pigs and 4 times through *G. morsitans*.

"Resistance to Bayer 205 is developed very slowly and is gradually lost. A strain of *T. rhodesiense* was made resistant to this drug by repeated administration of subcurative doses to infected mice between May, 1931, and September, 1932. The resistant strain was then passaged through mice by blood inoculation. Within a year the resistant strain had lost at least 90 per cent. of its resistance, and within 4 years had lost all trace of resistance.

"Resistance to Bayer 205 survives at least one passage through *G. morsitans*. A tryparsamide-fast strain of *T. brucei* was made also resistant to Bayer 205 by the repeated administration of subcurative doses of the drug to a series of infected guinea-pigs over a period of a year. After the resistant strain had been passaged through a short series of

guinea-pigs it was passed through *G. morsitans*. Examination of the strain before and after transmission by *G. morsitans* showed that its Bayer 205-resistant character had survived the cyclical development of the trypanosome in the tsetse-fly."

W. Y.

MURGATROYD (F.) & YORKE (Warrington). **Studies in Chemotherapy. XV.—Observations on the Loss of Transmissibility by *Glossina morsitans* of *T. brucei* maintained in a European Laboratory.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 173–194.

In this paper the authors have analysed the data collected in their various experiments on the transmission of normal and arsenic-resistant varieties of *T. brucei* by *G. morsitans*, with a view to considering whether they throw any light on the mechanism whereby a strain of trypanosomes becomes non-transmissible by *Glossina*. They summarize their work as follows:—

"Evidence is produced that a strain of *T. brucei* isolated from wild *G. morsitans* in 1931, and subsequently maintained in Liverpool by passage through guinea-pigs, partly by blood inoculation and partly by *G. morsitans*, remained transmissible by the tsetse for at least 4 years, and then became non-transmissible.

"Analysis of the results of dissecting flies used in the transmission experiments showed that in about 90 per cent. of the cases in which the trypanosomes became established outside the peritrophic membrane the infection spread forwards to the proventriculus.

"In only about 20 per cent. of cases in which the proventriculus was involved were the salivary glands also invaded. This could not be explained on the hypothesis that the flies which exhibited only a 'gut + proventriculus' infection had not lived long enough for the trypanosomes to reach the salivary glands. In all the instances in which it was possible to examine the point, the salivary glands had become infected by the 26th day or earlier. This observation agrees with the dictum of Duke that if the salivary glands are going to become invaded they will have done so before the 30th day after the infecting meal. Considerable numbers of flies were encountered in which proventricular infection had persisted long beyond this period without spreading forward to the salivary glands.

"In our experiments, therefore, establishment of the trypanosomes in the extraperitrophic space implied that in all probability the infection would reach the proventriculus; but proventricular infection did not necessarily imply that the salivary glands would eventually become infected, as suggested by Taylor (1932).

"The stages by which our strain of *T. brucei* became non-transmissible appear to be, firstly, that the trypanosome lost the capacity to extend from the proventriculus to the salivary glands; then, that it lost the capacity to extend forwards in the extraperitrophic space to the proventriculus; and, lastly, that it lost the capacity of establishing itself in the extraperitrophic space."

W. Y.

NASH (T. A. M.). **Climate, the Vital Factor in the Ecology of *Glossina*.**—*Bull. Entom. Res.* 1937. Mar. Vol. 28. Pt. 1. pp. 75–127. With 7 figs. & 3 plates. [20 refs.]

In this long paper Nash first of all deals with the ecology of *G. submorsitans* and *G. tachinoides* in West Africa, and then he passes

to a comparison of the ecology of the East and West African races of *G. morsitans*. From 1927 to 1932 he worked on the ecology of *G. morsitans* at Kikori in Tanganyika, and from 1933 to 1936 he carried on his investigations on the ecology of *G. submorsitans* and *G. tachinoides* at Gadau in Northern Nigeria.

The author gives the following interesting summary of his work on *G. submorsitans* and *G. tachinoides* in West Africa :—

“ *The Seasonal Factor.*

“ 1. The period of stress due to extreme climatic conditions is far shorter in the forest than in the meadow-pan.

“ 2. *G. tachinoides* is primarily dependent upon riverine vegetation or residual forest, and has only a very limited wet season spread. *G. submorsitans* is primarily an open woodland fly with great powers of dispersal which are annually checked by adverse climate that enforces a temporary dependence upon the riverine forests.

“ 3. *G. tachinoides* abounds within the stream-bed or residual forest ; *G. submorsitans* abounds on the forest fringe.

“ 4. The dispersal of both species is closely associated with evaporation and saturation deficiency. A mean monthly evaporation of 20–28 cc. and a saturation deficiency of 5 to 8 millibars results in maximal dispersal ; dispersal yields to concentration as the evaporative power of the air increases above these zones.

“ 5. The extent of the annual dispersal is indirectly governed by the duration of the wet season—the longer the season the more extensive the dispersal.

“ 6. The population of *G. submorsitans* steadily increases throughout the rains as the evaporation falls, and becomes maximal towards the end when the evaporation is in the optimum zone (20–25 cc.) ; density steadily falls throughout the dry season as evaporation rises, and becomes minimal at the end when evaporation is maximal. *G. tachinoides* is believed to behave similarly, but the optimum zone of evaporation is probably about 6 to 10 cc.

“ 7. Adult longevity is primarily dependent upon maximum temperature ; it decreases as the temperature rises and increases as it falls. Longevity is greatest in the heavy rains and cold season when the mean monthly maximum temperatures are lowest, being between 85° and 90°F.

“ 8. The frequent occurrence of maximum temperatures between 90° and 100°F. is believed to result in a shortened life, but no immediate fatalities occur until the maximum temperature enters the critical zone (*G. submorsitans* 103·5°–106°F. ; *G. tachinoides* 103°–105°F.).

“ 9. *G. submorsitans* breeds during ten months of the year, and *G. tachinoides* during eleven months. Both species breed freely throughout a tremendous climatic range, the only cessation being in the heavy rains, when an almost saturated atmosphere appears to arrest reproduction.

“ 10. In the early and mid-dry seasons *G. submorsitans* breeds primarily on the floor of small, isolated thickets throughout the open woodland, but in the late dry season it partly evacuates the thickets in favour of the residual forest ; it also uses rot-holes in trees growing in the thickets. *G. tachinoides* breeds extensively in small thickets in the early dry season, then it shifts to the residual forest, and finally, in the hot season, it moves to the moist sand of the river-bed ; it never uses rot-holes in trees.

“ 11. *G. tachinoides* shifts its breeding-grounds as the evaporation rises ; the pregnant females probably evacuate a site when the soil has lost too much moisture. *G. submorsitans* is less sensitive, possibly because its puparia are more resistant to high temperature and low humidity.

" 12. From the middle of the early rains until breeding ceases in August, *G. submorsitans* breeds under logs in the woodland savannah, whilst *G. tachinoides* breeds under isolated trees on the forest margin.

" 13. Extensive breeding does not necessarily produce a large adult population; the seasonal viability of the puparia has a more direct relationship to seasonal fly density than has the breeding rate.

" 14. The duration of the pupal period is directly related to the mean monthly temperature; the period varies from an average of 41 days in the cold season, when the mean temperature is about 68°F., to only 18 days in the hot season, when the mean temperature is about 86°F.

" 15. Fly activity is closely associated with the temperature. Both species are completely inactive when the temperature is below 60°F. or above 105°F. Fly are most active between 81° and 85°F.; hence in the heavy rains and cold season activity is maximal in the middle of the day, whereas in the hot season activity is then minimal. Tsetse seek to avoid excessive high temperature in the forest by becoming inactive near the ground-level where it is cooler.

" 16. Excessive evaporation, high maximum temperatures, and a great diurnal temperature range result in a greatly reduced fly population.

" 17. Locally the following conditions are optimal, but Gadau is near the hot, dry limit of the species' distribution:—*G. submorsitans*: Temperature constant at 79°F. with a saturation deficiency of 7 millibars; 11 millibars probably results in a higher breeding rate (26°C. and 5 mm., or 8 mm. for breeding). *G. tachinoides*: Temperature constant at 77°F. with a saturation deficiency of 4 millibars; 11 millibars probably results in increased breeding (25°C. and 3 mm., or 8 mm. for breeding).

" An attempt will now be made to co-ordinate the data upon the seasons which are favourable to the different fly functions with the ultimate size of the fly community.

" A large tsetse population can only be attained if the climatic conditions of the preceding months favour a progressive increase in the size of each generation. Growth of population must depend directly upon the following factors: (1) Parental longevity, (2) birth rate, (3) pupal period, (4) pupal mortality, (5) climatic conditions when offspring emerge.

" Clearly high parental longevity combined with a high birth rate and short pupal period will result in rapid breeding; but factors 4 and 5 are the key factors, since high pupal mortality or unfavourable climatic conditions for the offspring can frustrate any efforts made to increase the population by factors 1 to 3.

" In the heavy rains even though factor 1 is optimal it is ineffectual because factor 2 is then minimal. In the early dry season factors 2, 3 and 4 are probably favourable but are ineffective because factor 5 is unfavourable. In the cold season factors 1 and 2 are almost optimal, but are cancelled out by the adverse effects of 3, 4 and 5. In the hot season both key factors (4 and 5) are most adverse. After the break of the early rains factors 2, 3 and 4 are favourable and 1 and 5 are becoming progressively better. By the end of the early rains (2½ months later) breeding has decreased considerably, but this is probably counteracted by all the other factors, which are nearly optimal; in any case by this time the fly population has increased enormously.

" To summarise:—From the heavy rains onwards throughout the dry season insufficient factors are simultaneously favourable—factor is cancelling factor; but in the early rains the factors essential to reproduction synchronize, and then as the rains progress the climate becomes steadily more favourable for the emerging offspring, culminating with optimum conditions in the heavy rains when density of population is greatest; but the peak has then been reached, because the wet season cessation of

breeding is disastrous to the community, since no new generation emerges until well on into the unfavourable dry season.

" It has been shown that the vital functions of the fly are governed by quite different meteorological factors, and that the final result of these fly functions combined, as represented by the ultimate fly density, is related to the evaporation. This is understandable, as evaporation itself is a composite factor, and when evaporation is optimum, favourable medium temperatures and high humidities occur, and when evaporation is excessively high, unfavourable maximum temperatures and very low humidities are recorded; further there is evidence to show that evaporation directly affects pupal mortality—a key factor. Evaporation epitomizes the individual meteorological factors in the same way that ultimate fly density summarises the final result of the vital fly factors.

" The Food Factor.

" 1. Both species are best fed in the late dry season and early rains when fly and game concentrate near the water. Tsetse are hungry in the heavy rains when floods and long grass cause the river-plain to be evacuated by most of the game; hunger is greatest in the cold season when low temperature reduces the hours of activity.

" 2. Seasonal nutrition only depends directly upon climate in localities where the seasonal food supply ceases to be the dominant factor, thus permitting the influence of humidity on the hunger cycle to control the nutrition of the community.

" 3. Locally, the degree of hunger is never sufficient to affect the community materially; fly showing signs of starvation are rare.

" 4. Unlike *G. submorsitans* females, the females of *G. tachinoides* readily attack man; this species can thrive in isolated colonies surrounded by extensive cultivation, suggesting that it can subsist and reproduce almost entirely on human blood, and hence is a far more serious vector of sleeping sickness than *G. submorsitans*, which is only found in thinly populated areas where game animals still survive.

" 5. Females of both species attack man most readily in the seasons when game is scarcest.

" 6. *G. tachinoides* is always better fed than *G. submorsitans*, probably because of its ability to thrive on either mammalian or reptilian blood; also, its sedentary habits keep it in the vicinity of the forest islands where game and reptiles are never entirely absent.

" The food factor is considered to be the least important of the three great factors that govern the existence of tsetse; locally, food shortage has never been sufficiently pronounced to affect the community adversely. As in Tanganyika, fly density is highest when game is scarcest and lowest when game is most abundant; climate is the vital factor, not food, which always suffices.

" The Vegetation Factor.

" 1. The residual forest islands provide the true habitat for both species; they offer the fly protection when the climatic conditions elsewhere are insupportable, and provide suitable breeding-grounds and an adequate food supply; further they are resistant to fire and flood.

" 2. The woodland savannah with its small thickets is the temporary habitat of *G. submorsitans*, and for many months in the year enables this species to spread and maintain itself at a considerable distance from the residual forest. To a much lesser extent this is true for *G. tachinoides*.

" 3. It is suggested that the term ' meadow-pan ' might be employed in the tsetse literature to replace the confusing collection of local native names that are at present used in describing this type of seasonal swamp.

" 4. Both species are most numerous and are best fed in the vicinity of the residual forest or true habitat. *G. submorsitans* lives mainly on the forest fringe, but *G. tachinoides* lives within.

" 5. Pronounced female centres and feeding-grounds of the East African type do not occur ; however, catches from the open country do show a higher female percentage and greater hunger. The higher the fly density the lower the female percentage.

" From an economic aspect there can be no doubt that vegetation is by far the most important factor ; we cannot alter the Nigerian climate, but by modification of the vegetation which forms the true habitat we may be able to modify the forest's micro-climates until they become incapable of befriending the tsetse in its time of need.

As a result of his ecological comparison of the East and West African races of *G. morsitans*, the author reaches the following conclusions :—

" 1. The small residual forest islands of N. Nigeria are analogous to the extensive *Berlinia-Brachystegia* woodlands of Tanganyika, in that both form the true habitat of *G. morsitans*.

" 2. In both countries extensive meadow-pan provides a thinly populated feeding-ground with a high female percentage, tsetse being hungrier there than elsewhere ; but in West Africa, dry season concentrations of hungry tsetse showing a high female percentage never form within small meadow-pans, such sites being uninhabitable at that season.

" 3. Females of both races attack man most readily where fly density is lowest, and least readily where the density of population is greatest.

" 4. The percentage of females emerging from thousands of puparia collected in the bush was 50 per cent. at Kikori and 51 per cent. at Gadau, but the average female percentage among fly that attacked man was only 11 per cent. in each fly-belt, suggesting that the females of neither race is partial to human blood.

" 5. Seasonal nutrition at Gadau is directly controlled by seasonal food-supply, and not by seasonal humidity as in Tanganyika. Since the influence of humidity upon hunger can be cancelled by pronounced seasonal fluctuations in the local food supply, the seasonal nutrition cycle is bound to vary throughout Africa.

" 6. At both Kikori and Gadau *G. morsitans* is scarcest when game is most abundant, indicating that the climatic factor controls fly density, not the food factor.

" 7. Both races are inactive in the early mornings of the cold season ; in view of results from extensive work in Nigeria, this inactivity is probably due to low temperature. The excessive heat of the West African late dry season causes pronounced mid-day inactivity, which was never observed in Tanganyika. Both races are normally inactive shortly after sunset.

" 8. Both races tend to attack man above knee height, unlike *G. tachinoides* which attacks the ankles.

" 9. As the evaporation rises throughout the dry season both races concentrate in their true habitats, but concentration is far more pronounced in N. Nigeria owing to the severer climate and the much smaller areas covered by the true habitat.

" 10. Both races disperse when the rains break and the evaporation falls, but the longer wet season in Tanganyika results in much more extensive dispersal, and the milder dry season that follows enables these advances to be consolidated, new fly-belts thus being formed. All attempts made at colonisation during the rains are annually checked in Nigeria by the severity of the following dry season.

" 11. In East Africa *G. morsitans* breeds primarily under fallen trees, but in West Africa it breeds promiscuously on the floor of thickets and forest islands—an adaptation to the climate, as shown by its reversion to logs in the few favourable weeks at the end of the early rains. Both races sometimes use rot-holes in trees, but such sites are only used in N. Nigeria if the trees grow within thickets.

" 12. Owing to the difference in breeding habits, log traps of the type that were very attractive to the East Africa race, are unattractive in N. Nigeria.

" 13. With the exception of the heavy rains, when breeding partly or completely stops, both races reproduce throughout the year. Breeding is maximal in the early rains, but is also considerable in the first half of the dry season, especially in East Africa.

" 14. *G. morsitans* can breed through a great range of climatic conditions; only very high humidity and low evaporation seem to affect reproduction.

" 15. In both races the duration of the pupal period depends upon the mean monthly temperature, being shortest in the hot months and longest in the cold. The variation at Kikori was 29-52 days, and at Gadau 19-41 days.

" 16. The density of the population of both races follows a seasonal cycle that is basically the same; density decreases in the dry season, becoming minimal towards the end; density starts to increase at the beginning of the rains, becoming maximal some months later. This density cycle is closely related to the seasonal saturation deficiency and evaporation.

" 17. When the mean monthly saturation deficiency is between 5 and 6 millibars and the mean evaporation is 20-25 cc., the population of both races is maximal; as the saturation deficiency and evaporation increase above or decrease below these optimum zones, so does the fly density decrease.

" 18. Providing that the mean saturation deficiency and evaporation are optimal, the population in a *G. morsitans* fly-belt will be maximal, irrespective of the mean temperature (within wide limits).

" 19. Since identical conditions of saturation deficiency and evaporation are associated with optimal conditions for both races, it is suggested that they are physiologically similar, and that their vital functions are governed by identical laws. This would account for the different nature of the true habitat selected by the West African race, which, having failed to adapt its constitution to the climate, has perforce adapted its habits; had it evolved a constitution which preferred a higher degree of evaporation and temperature, the greater frequency of optimum conditions would have enabled it to become as widespread a pest as its East African representative.

" 20. It is considered that optimum conditions for *G. morsitans* could be reproduced artificially by keeping the saturation deficiency at 6 millibars (4.5 mm.) with the temperature constant at 73°F. (22.8°C.), by raising the saturation deficiency breeding would be increased, possibly at the expense of the community."

W. Y.

POTTS (W. H.). **The Distribution of Tsetse-Flies in Tanganyika Territory.**—*Bull. Entom. Res.* 1937. Mar. Vol. 28. Pt. 1. pp. 129-148. [46 refs.]

This paper gives information regarding the eight species of tsetse found in Tanganyika; they are *Glossina brevipalpis*, Newst., *G. longipennis*, Corti, *G. fuscipleuris*, Aust., *G. palpalis*, Rob-Desv., *G. morsitans*, Westw., *G. swynnertoni*, Aust., *G. pallidipes*, Aust., and *G. austeni*, Newst. *G. tachinoides*, *G. fuscii* and *G. tabaniformis* have been recorded from the Territory, but these were undoubtedly mis-identifications, the first for *G. austeni* and the other two for *G. brevipalpis*.

The author considers that it is not very likely that any addition will be made to this list in the future, except that possibly *G. fusca* var. *congolensis* may be found along the western borders of the Territory.

Observations are recorded dealing with the distribution of each of these species, and these are followed by a brief account of the fly

belts of the Territory. They are eleven in all:—(1) The Great Western Belt, (2) the Musoma-Usukuma Belt, (3) The Eyasi-Mkalama Belt, (4) the Rift Valley Belt, (5) the Central Province Belt, (6) the Hika Belt, (7) the Masai Belt, (8) the Natron Belt, (9) the Pare-Usambara Belt, (10) the Great Eastern Belt and (11) the Rungwe Belt.

The paper concludes with an account of some natural features affecting the distribution of tsetse flies and with speculations regarding possible extensions of the fly-belts. The author summarizes his observations as follows:—

"1. Details are given of the distribution of the eight species of tsetse occurring in the Tanganyika Territory (*G. brevipalpis*, *G. longipennis*, *G. fuscipleuris*, *G. palpalis*, *G. morsitans*, *G. swynnertoni*, *G. pallidipes*, and *G. austeni*).

"2. The effect of past climatic changes on the present distribution of some of the species is discussed in a somewhat speculative manner.

"3. The detailed information is summarised in a general description and map of the fly-belts of the Territory.

"4. The effect of certain broad vegetation types and major topographical features on the distribution of species of tsetse in Tanganyika are discussed.

"5. The effect of the major topographical features in limiting the distribution of the fly is always found to reside in some accompanying vegetative or climatic feature.

"6. Possible and likely extensions of the fly-belts are briefly indicated; if these should take place, but little of Tanganyika Territory would remain uninfested by tsetse-fly. The possibility of natural retreat of fly-belts is also discussed.

"7. A few details are given of the habits and habitats of some of the lesser known species (*G. longipennis*, *G. fuscipleuris* and *G. austeni*)."

W. Y.

JACKSON (C. H. N.). **Some New Methods in the Study of *Glossina morsitans*.**—Reprinted from *Proc. Zool. Soc. London*. 1936. Part 4. pp. 811–896. With 9 figs. & 12 plates. [26 refs.]

The author gives an account of ecological studies made during a period of over a year (ending December 1935) in a region in Tanganyika said to be typical of vast areas infested by the fly. The climatic records show a mean annual temperature of 23.8°C. (74.9°F.), with absolute limits of 35.6°C. (96°F.) and 6.1°C. (43°F.). The total rainfall for 1936 was 884 millimetres (34.8 ins.), and no rain at all fell between May and October. The country is "wooded, nearly flat and exceedingly monotonous," features which, with typical vegetation, are shown by several plates. During most of the period under consideration game was abundant.

The physiological state of the male flies caught at different times of year was studied. The author has now proved that the "hunger stages" which he previously described really do represent stages in the digestion of a blood meal, and he shows that several different workers (including one native) obtained almost identical results when they sorted the same collection of flies into hunger stages. These diagnoses of "hunger" by examining wild flies are well supported by chemical analyses. Results are given showing changes in the nutrition of the fly population at different seasons. The flies feed more frequently in hot dry weather than when it is cool and damp, and the author

states that the rapidity of onset of hunger may be correlated with the integrated saturation deficit, though he has not proved that dryness itself causes more rapid utilization of food.

A detailed investigation of the changes in numbers of the fly population in certain areas is described. The chief method was by releasing marked flies and noting the proportion of these in a large number of recaptures on a subsequent date. The methods described may be used for finding the number of flies in either an isolated colony or an area which is not "closed," and from which they are able to emigrate. The results are independent of activity as shown by the ordinary "fly round." Formulae given in this paper will enable other workers not only to measure the numbers of flies in an area, but also to find the standard error of the result. This is a considerable advance in ecological method.

In an area of 4.7 square kilometres (1.8 sq. miles) the fly population (males only) rose from 1,300 in February to 4,900 in July and then fell catastrophically to 1,200 in August. This fall appears to have been caused by emigration. A few experiments indicate that female flies probably live rather longer than males, but not many significant figures were obtained for that sex. As yet no clear-cut effects of climate on the fly numbers in the country as a whole have been shown, but further work on these lines seems bound to give enlightening results.

Finally the author suggests that there may be no "absolute density" of population of tsetse flies, above which they seriously compete with one another, for where there is sufficient food for a few flies there will be sufficient for a much greater number. Adverse factors such as enemies, climate, etc., will act equally against small and large fly populations. He suggests that density may be connected with "social habits."

Two points in this paper and in current work on tsetse call for comment. First, excessive attention is paid to the male part of the population. This may be unavoidable because few females approach man, but in tsetse as in human populations it is the number "females capable of producing offspring" that is all important. No doubt the workers themselves realize that it is time more methods were devised for studying the females. Secondly, papers of this kind are important to ecologists and insect physiologists in all countries, and they would be less difficult to understand if the results were given in the standard international manner. In the paper under consideration temperatures are given in Fahrenheit, rainfall in inches, evaporation in cubic centimetres, weights in milligrams and humidities (saturation deficiency) in millibars. It is surely better to use the Centigrade thermometer, though it may be useful at present to put in °F. as well. Humidity should be given either as saturation deficiencies expressed as millimetres of mercury, or else as relative humidity. Now that the East African Meteorological Service no longer uses millibars in its publications, the last excuse for the use of that unit in papers of this kind has disappeared.

Kenneth Mellanby.

HARRISON (H.). The Shinyanga Game Experiment: A Few of the Early Observations.—*Jl. Animal Ecology*. 1936. Nov. Vol. 5. No. 2. pp. 271-293. With 5 figs. & 2 plates.

The general purpose of the experiments is explained in a foreword by Mr. SWYNNERTON. He puts forward the view that it is not

justifiable to undertake an indiscriminate slaughter of game animals as a way of controlling tsetse flies until we possess fuller information about the importance of different species of game as hosts of fly and trypanosome, and until other methods of control have been attempted. The present paper describes a carefully planned set of experiments and observations which are being undertaken on game animals in Tanganyika Territory.

The work is being carried out in several blocks of country, each of many square miles, in the neighbourhood of the tsetse laboratory at Shinyanga. The areas are already familiar to the entomologists, and a botanical survey of them is being carried out. The general plan is to treat the different blocks of country, which are isolated from one another by clearings, as different experimental areas. Some are to be left unmolested, or even rendered more attractive by providing water holes; in others the game is to be continually harassed, but not killed; in others again certain species of game animals are, as far as possible, to be exterminated. Throughout the experiment, the population of flies (*Glossina swynnertoni* principally) will be under continuous study by the method of "fly rounds." The experiments are planned to last a long time, but it is not quite clear from the text of the paper how far they have actually progressed. As a foundation the author sets out in considerable detail certain observations on 10 species of wild Ungulates. For each of these he defines, as far as possible, the food and habitat, breeding seasons, etc.

P. A. Buxton.

SYMES (C. B.) & MCMAHON (J. P.). **The Food of Tsetse-Flies (*Glossina swynnertoni* and *G. palpalis*) as determined by the Precipitin Test.**—*Bull. Entom. Res.* 1937. Mar. Vol. 28. Pt. 1. pp. 31-42.

The authors had originally intended to conduct an inquiry into the food of *G. palpalis* in various regions in Kenya, but after discussion with other workers it was agreed to extend the inquiry to other species from any part of East Africa. Their preliminary results, though mostly inconclusive, have narrowed the field of inquiry sufficiently to warrant a continuation of the work along very well-defined lines.

Sera were obtained from various sources. The animals dealt with were shot and bled into large sterile jars. The blood was allowed to clot overnight and the serum removed into sterile rubber-capped bottles. A small crystal of thymol was added to each bottle of serum, which was collected at any considerable distance from Nairobi. At the laboratory all the sera were filtered through a Seitz filter, put into ampoules, and stored in a refrigerator.

Young healthy rabbits were used for the preparation of all antisera.

In order to prepare the stomach contents of *Glossina*, the flies were killed by pressure of the thorax and allowed to dry. The authors state that obviously more exact results would be obtained by dissecting out the stomach from fresh flies. A certain loss resulted from the presence in many flies of an excess of fat, which rendered the stomach solution cloudy, and therefore unfit for accurate reading. Further loss probably occurred from continuation of digestive or bacterial action in stomachs after the flies were killed. The abdomen of each fly to be tested was ground up in the cell of a concave slide with ten drops of normal saline. This solution was allowed to stand for about an hour at room temperature, and was then centrifuged.

At the beginning of the work all stomachs were ground up and tested, but later, in order to conserve the antisera, only those stomach solutions showing a colour were tested.

The tests were carried out in capillary tubes as used for calf lymph. Antiserum was first drawn into the capillary for about a third of its length. This was followed by an equal amount of the stomach solution under test. Control tubes contained a mixture of stomach contents in normal saline. The tubes were allowed to stand for an hour at 37°C. and were then examined before an obliquely descending light with black background. Tubes showing definite flocculation or precipitation were recorded as positive.

A detailed account of the observations is given, and the authors summarize their results as follows :—

" 1. The main food hosts of *Glossina swynnertonii* in a district of Tanganyika appear to be (a) one or more Bovids, perhaps kudu or roan, exhibiting a close blood relationship to ox or buffalo ; (b) giraffe ; (c) pig. There is evidence that monkey or baboon is also made use of and that zebra definitely is not.

" 2. With regard to *G. palpalis* on Maboko Island, crocodile and hippopotamus are important hosts. But they are far less important than we had supposed. The majority of flies appear to have fed on some animal not yet determined."

W. Y.

SYMES (C. B.) & VANE (R. T.). **The Eradication of *G. palpalis* from River Areas by the " Block " Method.** (An Experiment Financed by the Colonial Development Fund.)—61 pp. With 16 plates, 5 charts & 3 maps in pocket. 1937. Nairobi, Kenya Colony : Govt. Printer.

In Nyanza Province, Kenya, human trypanosomiasis is an important disease among the remaining population, and the presence of the vector, *Glossina palpalis*, prevents the most fertile land from being inhabited. The fly is found in the bush which fringes the lake and rivers ; the bush (and the fly) seldom extends more than a few hundred yards from the water. At present, infection takes place mainly at watering places and fords. Complete clearing of the bush would eradicate the fly, but this would be expensive, erosion and desiccation would occur, while wood, hut poles, etc., essential to the natives, would become unobtainable. This paper is an account of an attempt to free the bush from tsetse with the minimum clearing and the minimum expense.

The method found most practicable was to catch the adult flies by hand in nets. First riverine bush was divided into blocks 2 miles long by means of clearings about 1,000 yards wide. Then paths were made along each side of the river, and these paths were patrolled on several days a week by squads of natives with nets who caught as many flies as they could. In one block over 5,000 flies were caught between October and December 1933, while only 7 individuals were caught during the first 9 months of 1935. There was no corresponding reduction of flies in a control area in which flies were caught, counted and released. The cost of eliminating *G. palpalis* by hand-catching from one mile of riverine bush is about £40, while complete clearing costs £250. We do not yet know whether the bush is likely to become re-infested, but the cost of occasional patrols should be less than that of preventing regeneration of bush in ordinary clearings.

Traps captured a number of flies, but not sufficient to reduce the population very much, so that it is doubtful whether the present type of trap is of any practical use against riverine *G. palpalis*. In this area pupae were seldom found in accumulations in typical "pupa sites" and a very thorough search over an area of 12,000 square yards showed that the 84 living pupae found occurred in 57 scattered sites. Pupae appear to be deposited anywhere where there is moderate shade, and collection is too expensive to make this a practicable method of attack.

The work described in this paper has already opened up a considerable area which has been repopulated by natives who are growing crops of commercial value. The details which are given for all expenses (details which will be very useful to other workers) show that this method of eliminating the tsetse fly, under the particular conditions which exist in this part of Kenya, is one which is economically satisfactory. It is perhaps a pity that funds did not allow an entomologist to study the fly-population during the whole period, for this is the first case on record where the tsetse has been eliminated without the ecological factors in the environment being altered, and many interesting facts about the biology of the fly might have been discovered. The authors have, however, compiled and published much information and have obtained results of scientific as well as economic importance for a remarkably moderate expenditure.

Kenneth Mellanby.

VICARS-HARRIS (N. H.). *Glossina swynnertoni*, Austen, in Relation to Various Vegetation Types.—*Bull. Entom. Res.* 1936. Dec. Vol. 27. Pt. 4. pp. 533-557. With 18 figs.

Amplly illustrated by means of graphs, an account is given of a preliminary investigation, by means of fly-rounds, into the relations between *G. swynnertoni* and vegetation in the Shinyanga and Maswa areas of Tanganyika Territory. Fifteen types of vegetation are differentiated, and graphs based on the catches of fly during periods of from one to nearly three years show "the apparent fly density in the different vegetation types at different seasons." In this respect there would seem to be definite evidence of seasonal preference on the part of *G. swynnertoni*, which, after a marked rainy season concentration in hard-pan, disperses and "spreads out more and more into the shadier or better-grassed types as the dry season arrives and progresses Where the hard-pan is in immediate contact with extensive thickets or a strip of riverine forest this dispersal does not take place, but fly remains in that type of hard-pan, using, it is suggested, the thickets for breeding and resting." How far "these apparent vegetation preferences of the fly are connected with game movements and preferences" is not yet certain, but "Hunger does *not* appear to be a factor of prime importance influencing the fluctuations of apparent fly density in different vegetation types."

E. E. Austen.

SWYNNERTON (C. F. M.). *The Tsetse Flies of East Africa. A First Study of their Ecology, with a View to their Control.*

This book was reviewed on p. 363.

GRAF (H.). Ueber den Primäraffekt und die Inkubationszeit der Schlafkrankheit. [**On the Primary Lesion and Incubation Period of Sleeping Sickness.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 213-239. [44 refs.]

In this paper the author summarizes the literature dealing with the primary lesion in sleeping sickness and the related question of the incubation period. He also describes 7 observations made by himself, 4 of which have been previously recorded [this *Bulletin*, 1929, Vol. 26, p. 703].

The primary lesion in sleeping sickness is a furuncle-like swelling of the skin, which does not produce pus, and which appears soon after the bite of an infected *Glossina*. That such a swelling is due to the trypanosome, and not to inflammation resulting from the bite itself or to secondary infection, is proved by the discovery of large numbers of trypanosomes in the lesions, and by the fact that it is quickly cured by germanin.

The author has no doubt that the trypanosome chancre represents a tissue reaction to the injected trypanosomes, which multiply in the lymph spaces and then pass directly into the neighbouring lymphatic glands. A high virulence of the parasite and a low resistance of the host favours the development of the chancre. Very probably infection of the blood occurs simultaneously with the formation of the chancre, but, owing to the great volume of the blood, the parasites are found at an earlier date in the chancre. Reference to the phenomenon was fairly common in the pre-war literature, but between 1914 and 1929, when the author published his first paper on the subject, it had received little if any attention. Possibly the explanation of this is that the less pronounced trypanosome chancres, which probably constitute the majority, were easily overlooked by those who were ignorant of their existence. In late years, however, attention has been drawn to the phenomenon from various quarters. In 7 or 8 European cases seen by the author in the Cameroons there was a trypanosome chancre, and ZSCHUCKE did not fail to observe it in the 20 cases encountered by him in Fernando Po and the neighbouring mainland in which information on the point was available. The phenomenon has also been recorded from the Congo, Angola, Rhodesia, Nyasaland, Mozambique, and East Africa. It has been seen both in *gambiense* and *rhodesiense* cases. Graf states that, although there is no doubt that the primary chancre is absent in a definite percentage of European cases, he is quite sure that it is a by no means rare phenomenon, and that possibly future observations will show that it is exhibited by the average European case.

In well-marked cases the trypanosome chancre consists of a raised, indurated button-like area, dark red or violet red in colour and up to 10 cm. in diameter. The surrounding tissue is oedematous and it is sensitive to pressure and painful. In one of Graf's cases the lesion was as big as a 3-mark piece and felt like a button in the oedematous tissue; the red centre was surrounded by a waxy halo and this in turn by a reddish zone: puncture of the waxy halo revealed the presence of numerous trypanosomes. This lesion is sometimes referred to as a pseudo-furuncle, because it does not suppurate. Whilst in pronounced cases the lesion is very characteristic, it is often little marked and takes the form of a small bluish-red indurated slightly raised area, which, however, can be distinguished from a non-infective bite because it is harder, more sharply demarcated, and persists for some days.

Well-marked primary lesions are always associated with severe general symptoms, which manifest themselves soon after the appearance of the lesion, *e.g.*, rigors, high temperature, marked asthenia and rapid emaciation; the neighbouring lymphatic glands quickly become enlarged and are sensitive and painful. When the primary lesion is but slightly developed the general symptoms are mild. A strongly pronounced primary lesion may last for many weeks, but reaches its maximum development in a few days. Slightly marked primary lesions last only a few days. Sometimes there may be several primary lesions. Occasionally the primary lesion can take the form of a painless ecchymosis or of a large purpuric spot. Non-infective tsetse bites are in general not followed by inflammatory reactions, but occasionally they cause itching swellings, which subside by the next day and are at most slightly coloured; they are not associated with general symptoms or with enlargement of lymph glands.

The incubation period of the disease shows considerable variations depending on the virulence of the parasite and the sensitiveness of the host. In those cases in which the disease sets in acutely shortly after the infection there is probably no difference between *gambiense* and *rhodesiense* infections, but prolonged latency is more common in the former. In cases which begin acutely the interval between the infective bite and the appearance of trypanosomes in the blood is, in Europeans, about 10 days; but when the primary lesion is very pronounced trypanosomes may appear in the peripheral blood within a week of its appearance. Even in negroes the disease may begin acutely within 14 days. The interval between the infecting bite and the development of the primary lesion was, in one well-marked case of the author's, 5 to 6 days, and in another case only 3 days. MARTIN and LEBOEUF (1908) describe 2 cases in which the lesion appeared on the evening of the day of the infecting bites.

In conclusion Graf emphasizes the importance of looking for these primary lesions, and points out that trypanosomes can be easily found in them and in the neighbouring glands some time before they can be discovered in the blood.

W. Y.

COOKE (W. E.), GREGG (A. L.) & MANSON-BAHR (P. H.). **Recent Experiences of Mild or Symptomless Infections with *Trypanosoma gambiense* from the Gold Coast and Nigeria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 461–466. With 1 fig. [10 refs.]

The authors draw attention to the fact that for some time past particularly avirulent strains of *Trypanosoma gambiense* have been recorded from northern parts of West Africa and elsewhere. MACFIE (1913) recorded the existence of such a strain in Southern Nigeria, and on account of its low virulence he suggested that it should be separated as a distinct species under the name *T. nigeriense*. Manson-Bahr himself, over five years ago, stated that the virulence for Europeans of strains of *T. gambiense* in certain areas of the Gold Coast was becoming attenuated. Reference to similar mild strains of *T. gambiense* in Europeans infected in the Ivory Coast are to be found in the French literature, and VAN DEN BRANDEN has drawn attention to the existence of avirulent strains infected in the Belgian Congo. Avirulent strains of *T. rhodesiense* have also been mentioned by DAVEY (1908) and recently by LAMBORN and HOWAT (1936).

In the present paper the authors give details of three consecutive cases of West African trypanosomiasis of Europeans which have been diagnosed in 1929 in the ordinary routine of practice during the year, and of one earlier case. The detection of these cases was rendered possible only by the fact that the authors habitually make routine blood examinations of all their patients from West Africa. One patient showed no apparent evidence of disease and stated he felt quite well; another was discovered to have on his shoulder a characteristic circinate rash, whilst the other two cases gave histories of fever while on the Coast.

Attention is drawn to the fact that in two cases the local reaction caused by the infected tsetse bite, the so-called trypanosome "chancres" (GRAF, 1929) was still visible on careful examination, and that the blood infection was a particularly heavy one and therefore easily diagnosable. Details of the cases are given, and the results of blood inoculations into animals. Special attention is drawn to the vicarious appearance of trypanosomes in the peripheral blood of man, and to the lack of virulence of the organisms for laboratory animals.

W. Y.

DARRÉ (H.), MOLLARET (P.), TANGUY (Y.) & MERCIER (P.). Hydrocéphalie congénitale par trypanosomiase héréditaire. Démonstration de la possibilité du passage transplacentaire dans l'espèce humaine. [**Congenital Hydrocephalus in Hereditary Trypanosomiasis. Demonstration of the Possibility of Transplacental Passage in the Human Being.**—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 159-166; 166-176. With 2 figs. [34 refs.]

These papers give very interesting details regarding an instance of hereditary trypanosomiasis. The child was born at Marseilles on 22nd February, 1934. The birth was perfectly normal, but the accoucheur's attention was immediately drawn to two points—firstly the small weight of the baby, and secondly the abnormal size of its head. Three weeks later the mother noticed an intense dilation of the superficial veins of the head. In April 1934, the child began to suffer from attacks of fever. A diagnosis of congenital syphilis was made and antisyphilitic treatment given. The child continued to exhibit an undulant type of fever until 3rd November, 1935, when a lumbar puncture was performed; the fluid was clear, albumen 0.40, leucocytes 55, Wassermann negative. Further antisyphilitic treatment was given without result.

The child was again admitted to the Pasteur Hospital on 4th December, 1935. Signs of hydrocephalus predominated. On 25th January, 1936, another lumbar puncture gave the following results—albumen 0.50, cells 120, Wassermann negative. It was then decided to search carefully for trypanosomes. On 2nd February, 1936, a lumbar puncture was made, the fluid centrifuged, and the deposit examined microscopically; trypanosomes were found and various laboratory animals infected. The parasite had the characters of *T. gambiense*. Treatment with tryparsamide was attended with excellent results.

In the second paper the authors gave a medical history of the mother of this child. The parents had spent 32 months in the Tchad district and had remained in good health except perhaps for malaria. The

wife became pregnant and decided to return to France in October, 1933, when she was 5 months pregnant. Before reaching the coast she had an attack of fever which was considered to be malaria; a second attack of fever, which occurred when she was on the ship on the way to France, was accompanied by a circinate erythema. The voyage ended without further trouble and the child was born at term in Marseilles. Two months later there was a further attack of fever and this also was accompanied by a rash similar to the former. She was seen by a number of doctors, who, in view of the state of the child, considered the case to be one of syphilis. Further fever occurred during the year, but it was not until February 1935, that trypanosomes were found and the true diagnosis made.

The authors next describe in great detail the journey the patient made from Tchad to the coast, and reached the conclusion that she was probably infected on the Chari some time between 23rd October and 4th December, 1933. The patient was treated and apparently cured with tryparsamide. W. Y.

CALWELL (H. G.). **The Pathology of the Brain in Rhodesian Trypanosomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 611-624. With 16 figs. on 4 plates. [15 refs.]

The pathological lesions described in this paper are based on the examination of the brains of 17 cases of *rhodesiense* trypanosomiasis in Africans. The brains were removed entire; incisions were made into the lateral ventricles and these were kept open by cotton wool, and the whole brain immersed in 10 per cent. formol-saline. For histological examination pieces were taken from the frontal, parietal and occipital cortex, the subcortical white matter, the corpus callosum, basal ganglia, mid-brain, pons, medulla, cerebellum and choroid plexuses.

Clinical details and the post-mortem findings are given of each of the 17 cases. For the most part the only clinical evidence of involvement of the central nervous system was the abnormal condition of the cerebrospinal fluid. Many of the patients were insufficiently treated.

It is recorded that MOTT (1906) found a chronic leptomeningitis in sections of the cortex, base of the brain, the cerebellum and the spinal cord from cases of *T. gambiense* infection. He examined 21 brains and found that the meningitis was markedly basal in three, pneumococcal in one and purulent in one. MARTIN and DARRÉ (1909) found that the meningitis in 4 cases of Gambian trypanosomiasis chiefly affected the vertex of the cerebral hemispheres. In the author's 17 cases only one exhibited macroscopic basal meningitis; there was one pneumococcal. With this exception the meningitis was always on top and hardly ever extended more than half way down the sides of the hemisphere. Calwell never saw meningeal adhesions at the base of the brain. Microscopically, however, there was generalized leptomeningitis. The intensity of the cell infiltration varied from brain to brain and from area to area. The pia arachnoid was infiltrated with small round cells, lymphocytes, polymorphonuclear cells and morular cells. In 10 of Calwell's cases lumbar puncture had been done during life, but the intensity of the meningitis in any given case was not reflected in the condition of the spinal fluid.

The perivascular infiltration, as seen by Calwell, consisted in a proliferation of the vascular endothelium and packing of the Virchow-Robin space with lymphocytes, plasma cells, glia cells and morular cells. The Virchow-Robin space is the continuation of the sub-arachnoid space formed by the reflection of the pia mater along each blood vessel which enters the nervous tissue. It can be traced along the larger arteries and veins to the arterioles and venules, but has not been demonstrated around the capillaries (BIGGART, 1936). In 14 of Calwell's cases perivascular infiltrations were abundant, and in the remaining 3 they were scanty.

MOTT (1906) gave the name morular cells to certain large round or oval cells with a deep staining nucleus pushed up to one pole, and the cytoplasm consisting of clear spherules giving the cells a mulberry appearance; he thought they were degenerate plasma cells. PERRUZI (1928) concluded that the morular cells have a multiple origin in trypanosomal encephalitis, but that the neuroglia is their most frequent origin. MACKIE (1935) found these cells most frequently in the cellular exudate of the pia mater; he also found them in the perivascular cuffs and in the brain substance not obviously in connexion with blood channels. MACKIE refutes the view that their origin is invariably nerve cells as he encountered them sometimes outside the nervous system. Calwell found morular cells in all the brains of his series; they were abundant in 11 and scanty in 6 cases. He discovered them in every part of the brain, except the choroid plexuses.

The choroid plexuses were examined in 8 cases. They were normal in only one brain, and in this patient the spinal fluid a month before death contained 333 cells per cmm.; the protein was 0.028 per cent. In the other cases Calwell found round cell infiltration, fibrosis, fibrinous exudate and oedema. In 3 cases many round bodies like corpora amylacea about 70μ in diameter were seen. These bodies, which are due to degeneration of parenchymatous tissue, are commonly found in asylum practice in the brains of old people.

There was an increase in glia cells in the neighbourhood of vessels, especially those which had infiltrations round them. Calwell found no changes in the neurones. He examined 14 brains for demyelination and found evidence of it in eleven cases. The areas of demyelination were all perivascular and were very small, but could be found by the low power of the microscope. Such areas were most common in the subcortical white matter, next in the medulla and pons, and least in the cerebellum. Trypanosomes were not found in any part of the brain.

W. Y.

SICÉ (A.) & BONNET (P.). Contribution à l'étude des variations de l'équilibre protéique du sérum sanguin au cours de la trypanosomiase humaine. [*Contribution to the Study of the Variations of Protein Equilibrium in Blood Serum during Human Trypanosomiasis.*—*Marseille-Méd.* 1936. Dec. 25. Vol. 73. No. 36. pp. 707-712.

This paper describes the authors' observations on the quantitative changes in the two heat coagulable proteins of the serum—serum-albumen and serum-globulin—which occurred during the course of sleeping sickness. The serum-globulin was considered as a whole, and no attempt was made to divide it into its various fractions, viz., euglobulins, pseudo-globulins, etc. Patients in various stages of the

disease were selected for the investigation. The methods used for estimating the proteins are described, and observations were made on ten patients.

Previous work by various authors has shown that the total protein in the serum of normal human beings varies between about 77.8 gm. to 80.5 gm. per litre. The quantity of serum-albumen is greater than that of serum-globulin. EPSTEIN gives the value of the former as 46.6 gm., and ACHARD gives the serum-albumen as 45 to 55 gm. and the globulin as 25 to 35 gm.

The authors' work on sleeping sickness cases showed that as the disease progresses, there is an increase in total quantity of protein, and this is the more marked as organic lesions are the more pronounced; thus, with one exception, the quantity of serum-protein exceeded 100 gm. per litre in all the cases in which the cerebrospinal system was involved. This increase in total protein was chiefly due to increase in the serum-globulin, which in one case reached as much as 75.8 gm. per litre. The amount of serum-albumen just as frequently falls below normal as rises above it. In sleeping sickness, therefore, there is a breakdown of the equilibrium of the two serum proteins, the ratio of the amount of globulin to that of albumen rising considerably.

W. Y.

MILLOUS. Le traitement de la maladie du sommeil au Cameroun. [**Treatment of Sleeping Sickness in the Cameroons.**—*Ann. de Méd. et de Pharm. Colon.* 1936. Oct.-Nov.-Dec. Vol. 34. No. 4. pp. 966-995.]

This paper reviews the work done on the therapy of sleeping sickness in the Cameroons.

Dealing first with treatment in the field, the author points out that commencing in 1908, atoxyl was employed. It resulted in a peripheral sterilization of 50 per cent. of cases, but, as 40 per cent. relapsed, the total cures were only 10 per cent. in heavily infected districts. In places where the endemic index was slight the results were better. Then came tartar emetic, but this was soon abandoned as unsatisfactory. Tryparsamide followed, but, owing to its moderate trypanocidal activity, it became reserved for second stage cases. Up to 1932 the general rule was atoxyl for first stage cases and tryparsamide for those in the second stage; moranyl was only used for old positive cases.

Lumbar puncture was rarely performed in the field before 1932 but, owing to the work of LEDENTU, it became extensively practised during the latter part of that year. In the third portion of 1932 the number of lumbar punctures made were 2,556, whilst in 1933 the number rose to 23,323. The treatment then adopted was a series of 12 weekly injections of orsanine for first stage cases, and tryparsamide, preceded by 2 injections of orsanine, for second stage cases. [Orsanine, or 270 Fourneau, is o-oxy-p-acetyl-amino-phenyl arsinic acid; see this *Bulletin*, 1932, Vol. 29, p. 640; 1935, Vol. 32, p. 386.]

According to LEDENTU, patients should be kept under observation for 4 years, and then it is possible in the 5th year to declare cured those who for 4 years have not shewn trypanosomes in the peripheral circulation and whose cerebrospinal fluid has remained normal during that period.

In 1934 moranyl began to be used systematically in the Cameroons. The use of tryparsamide then became reserved for patients in an advanced stage in whom sterilizing doses of orsanine and moranyl would be dangerous, and as a sort of treatment of preservation. Orsanine, either alone or with moranyl, became the main treatment of the disease. Of Orsanine, however, in the classical doses of 0.02 gm. per kilo. it did not give the success which was originally hoped for. BONNET, for example, obtained only 5 (31 per cent.) permanent cures out of 16 cases. RICHE and TRINQUIER used larger doses of 0.025–0.03 gm. per kilo. and obtained only 32 per cent. of relapses out of 124 cases so treated.

Hospital treatment.—Having found that orsanine in doses of 0.02 gm. per kilo. did not give sufficiently good results, BONNET increased the dose to 0.03 gm. intravenously. Apparently, patients tolerated these doses well and the accidents were almost negligible. The results of this method of treatment were very good, BONNET obtaining 95 per cent. of successes among old cases and 87 per cent. among new cases. It is difficult to understand why the old cases, many of whom had previously been treated with other drugs, should give better results than the new cases. As MILLOUS observes, arsenic-resistance may not have played any part here. Whatever be the explanation, the fact remains that with all patients in the first stage of the disease 92.6 per cent. of successes were obtained. These successes can often be considered to be cures, because of the 228 patients treated, 109 have been re-examined 6 to 9 months after the end of treatment and blood and spinal fluid found to be normal. Even when the spinal fluid changed orsanine often gives good results. BONNET treated 78 such patients, and 80 per cent. of new cases and 67 per cent. of old cases showed improvement.

MONTALIEU employed a still larger dose of 0.04 gm. of orsanine per kilo., but gave the drug subcutaneously. Of 237 cases treated in this way, all except 6 were sterilized. But before large doses of orsanine are given it is necessary by careful examination in hospital to make sure that the patient is in good general condition. Both BONNET and MONTALIEU have shown that treatment with orsanine almost always results in considerable loss of weight.

Relapses may occur in the course of treatment or after the end of the course. BONNET states that sometimes there may be a relapse in the second and third week of treatment, or sometimes about the eighth week: these relapses are usually transient and the trypanosomes disappear without any modification of the treatment. More frequently, however, the relapses occur during the fourth or fifth week and the trypanosomes tend to persist in the blood. In order to deal with this it is necessary either to increase the dose of orsanine or to have recourse to moranyl. Those who exhibit no relapse during the full course of 12 weekly injections are probably cured, but in the case of those who exhibit one or more relapses at least 10 injections should be given after the last relapse. Patients who have relapsed after the tenth or twelfth injection have been given 20 to 22 injections without any trouble.

After-treatment.—At the conclusion of treatment the blood should be examined every 3 days for a period of a month. BONNET observed 13 relapses (5.7 per cent.) among his 228 cases. Immediately on the discovery of trypanosomes, treatment should be started again. Sterilization is easily produced and BONNET has observed only two

ient relapses during the second course of treatment. MONTALIEU, ever, recommends changing the drug for moranyl more quickly.

the examinations are negative the patient is examined occasionally to the end of the third month, and if the spinal fluid is normal they examined every 6 months until they can be declared to be cured. 90 per cent. of cases the single course of treatment suffices to cure and all subsequent therapy is useless.

With regard to patients in the second stage of the disease, and in this class the author groups together with those who show changes in the spinal fluid, all in bad general condition, Millous writes that nine must be used with care. Many such cases show a progressive loss of weight when treated with this drug, and in this event it should immediately be replaced by tryparsamide and moranyl.

MONNET gives 0.03 gm. of tryparsamide and 0.0075 gm. of moranyl kilo. of body weight each week for a period of 12 weeks.

MONTALIEU uses rather larger doses, viz., 0.05 gm. of tryparsamide 0.01 gm. of moranyl. The results are good, but whichever method employed there remains a number of cases who are not sterilized. Those who have resisted all attempts at medicinal therapy may be treated with the blood of a convalescent case. The blood donor should be a recent patient who has made a rapid recovery. Details are given regarding 2 groups of very advanced cases treated by this method (one intramuscular injection of blood every alternate day); the results in certain cases seemed to be encouraging.

The use of these pentavalent arsenicals was not unattended with accidents. Even orsanine in large doses must be given with caution and to people under observation in hospital. After the first injection nausea and headache are not uncommon; in 40 per cent. of the cases the nausea was followed by vomiting, conjunctival congestion, slowing of the pulse, and intense supra-orbital pain. These symptoms are not aggravated by the second dose and, as a rule, disappear two days after it. Among severe accidents have been noted—one case of grave icterus commencing 36 hours after a relatively small initial dose of 1.4 gm. in a 59 kilo. patient; one case of vomiting with bloody diarrhoea; and one case of exfoliative dermatitis. The most numerous accidents are visual and these may follow either tryparsamide or orsanine. Stress is laid on the value of intravenous injections of 20 per cent. sodium hyposulphite in these conditions.

The paper concludes with a consideration of the length of time and number of observations which are necessary before one is justified in declaring a patient to be cured.

W. Y.

VAMOS (S.). Traitement de trypanosomés dans un secteur du Moyen-Chari (A. E. F.). Etude de 3,705 observations. [**Treatment of Trypanosomiasis in a Sector of Moyen-Chari (A.E.F.). Study of 3,705 Observations.**].—*Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 1015–1022.

The author reviews the results obtained from the usual methods of treatment of sleeping sickness in the bush during the period which he spent in the highly endemic region of Chari-Logone.

Between 1919 and the beginning of 1935 some 5,222 cases of sleeping sickness have been discovered. Of this number, 943 have been found too recently to be dealt with here; 95 have died from other diseases,

and 479 have died from unknown cause. If these cases be disregarded there remain 3,705 which have been followed carefully.

Patients diagnosed in the first period.—These comprised 2,029 of which had a normal spinal fluid at the time of first puncture. These, 1,172 are considered to be cured after an observation of 5 to 10 years: they were treated with atoxyl, or rarely orsanine, in the bush during the usual medical tours. Other first stage cases have exhibited after one or more years of observation a changed spinal fluid; 34 cases fall into this category and apparently all of them were cured with tryparsamide. Still other cases, 484 in number, have shown any sign of nervous involvement, but so far they have not been observed for 1 to 4 years; probably the great majority will prove to be cured. The cerebrospinal fluid of 242 cases has become pathological after one to several years of treatment with atoxyl; they are still under treatment and it is too early to judge the result. Thus of 2,029 first stage cases, 276 have, notwithstanding atoxyl (or orsanine) treatment, passed into the nervous stage; 51 exhibited the first signs of nervous disease one year after diagnosis, 88 two years afterwards, 97 three years afterwards, 29 four years afterwards, and 11 five years afterwards. The author states that probably the last 11 cases, which lived in heavily infected regions, were really the result of re-infections. So far 65 cases have developed nervous trouble and have resisted treatment with tryparsamide. The number of deaths recorded amongst these 2,029 first stage cases is 32.

Patients diagnosed in the second period.—These number 1,676 and all exhibited a pathological spinal fluid at the first puncture. After preliminary doses of atoxyl or orsanine they have been treated with tryparsamide. The number of injections has not been limited to the arbitrary "standard cure" of 12 doses annually, as this was found in many cases to be insufficient. Of these 1,676 cases, 58 have been declared cured and 706 are still under observation and periodic treatment; cases are only regarded as cured if their spinal fluid has been normal for at least 5 to 6 consecutive years; 134 had a normal spinal fluid for a year, 79 for two years, 237 for three years, 155 for four years and 159 for five years [these figures include the 58 considered to be definitely cured]. The treatment has been less satisfactory in 334 cases; of these, 48 were complete failures, 140 had several relapses, 29 relapsed after a year of improvement, 20 after two years' improvement, 51 after three years', 25 after four years' and 22 after five years or more of improvement. The number of deaths recorded is 413, together with 165 others who were in a bad condition when seen and to whom tryparsamide was not given.

The results of all this work are summarized in a table from which it is seen that the percentage of failures among the 2,029 first stage cases was 1.75 and that of the deaths 0.9. Among the 1,676 second stage cases the percentage of failures was 9.01, and that of deaths 15.6.

W. Y.

KUNERT (Herbert). *Arzneimittelwirkung bei Trypanosoma brucei*. [The Action of Drugs on *T. brucei*.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Dec. 31. Vol. 89. No. 6. pp. 431-434.

The trypanosome with which Kunert worked was a strain of *T. brucei* brought to Berlin from Tanganyika in infected *Glossina* in October, 1932. It was maintained in mice, and when the present

experiments began it had reached the 302nd passage. Kunert examined the action of a large number of compounds (dyes, aromatic arsenicals, various antimonials and naganol) on infected mice. He finds that his results differ from those of previous workers who have used old laboratory strains of *T. brucei*, and draws the conclusion that the results of experiments on old strains have little significance for practice in the tropics. W. Y.

SCHERN (Kurt) & ARTAGAVEYTIA-ALLENDE (Ricardo). Die glykoprive Therapie der experimentellen Trypanosomeninfektion mit Anticomman. [**The Hypoglycaemia Therapy of Experimental Trypanosomiasis by Anticomman.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Dec. 31. Vol. 89. No. 6. pp. 484-487.

In continuation of their work on the therapeutic action in trypanosomal infections of substances which produce hypoglycaemia [this *Bulletin*, 1937, Vol. 34, p. 132] the authors have tried "anticoman" which is less toxic than synthalin. RUBINO and others have shown that synthalin has a toxic action on the liver, kidneys and pancreas, producing fatty degeneration. According to STAUB the toxicity of synthalin depends upon lactic acid formation—and GESSNER has shown that Synthalin B produced twice as much, and guanidin 17 times as much lactic acid as synthalin itself.

Tablets of anticoman contain :—

- 0.0077 gm. of dekamethylenediguanidin bitartrate.
- 0.1023 gm. of pancreas ferment powder.
- 0.0200 gm. of sodium phosphate.
- 0.0200 gm. of tannic acid.
- 0.0250 gm. of bismuth subnitrate.

It has been shown that rabbits will tolerate large doses of anticoman without toxic effects. Experiments are described showing that anticoman will cure mice infected with *T. equinum*. W. Y.

COLLIER (W. A.). & VERHOOG (M. J.). Ueber Arsen-Detoxin-Verbindungen. [**On Arsenic-Detoxin Compounds.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1937. Feb. 20. Vol. 90. No. 1. pp. 43-57.

The authors have continued their work on the therapeutic action of a series of compounds consisting of the condensation productions of oxy-amino- and oxy-amino-phenyl arsenoxides and their substitution products with high molecular keratin hydrolysates [this *Bulletin*, 1936, Vol. 33, p. 192]. In the course of their work another compound, designated "As XIII," was discovered to have exceptionally favourable properties. On nagana-infected mice it was found to have a therapeutic index of 1 : 66.6 to 1 : 80, when given subcutaneously, and 1 : 10 when given by the mouth. On *Sp. recurrentis* infections in mice its therapeutic index was 1 : 3.3 to 1 : 5 when given subcutaneously. The curative action was quicker than that of neosalvarsan.

The resistance of a salvarsan-fast strain of nagana to the various arsenic-detoxin compounds was found to vary ; the resistance to some of the compounds was greater than to salvarsan, while to other compounds it was less. It was found that both in infected mice and rabbits a series of a number of minute doses gave even better results than a single large dose. W. Y.

MERCIER (H.) & SOULAGE. Note au sujet de l'utilisation de la pyretothérapie dans la trypanosomiase au stade encéphalo-méningé. [Pyretotherapy in the Encephalo-Meningeal Stage of Trypanosomiasis.]—*Marseille-Méd.* 1936. Dec. 25. Vol. 73. No. 36. pp. 701-706.

The object of this note is to draw attention to the possible value of pyretotherapy in a sleeping sickness patient exhibiting meningeal symptoms after the usual treatment with tryparsamide. The authors point out that it is not their aim to question the therapeutic value of tryparsamide, but to utilize, after the drug has done all that it can do, a measure which has proved of value in comparable affections of the central nervous system. Details are given of the clinical history of a patient in whom this method was tried with apparently beneficial results. W. Y.

SCHILLING (Claus). Versuche zur Immunisierung gegen Trypanosomenkrankheiten. VII. Teil. [Experiments on Immunization against Tsetse Disease.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Dec. 7. Vol. 89. No. 5. pp. 306-311.

It was observed that young calves in the first weeks of life exhibited a considerable resistance to *T. congolense*, *T. brucei* and *T. vivax*. This resistance can be enhanced either by the method of minimal infection or by the injection of dried trypanosome vaccine. These experiments, which, in Schilling's opinion, indicate the direction which future work should take, were brought to an end by the author's departure from Africa. W. Y.

SCHILLING (Claus) with H. SCHRECK, H. NEUMANN & H. KUNERT. Versuche zur Schutzimpfung gegen Tsetse-Krankheit. VI. Teil. [Experiments on Immunization against Tsetse Disease.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Dec. 7. Vol. 89. No. 5. pp. 279-295. With 21 figs.

In this paper the author describes further isolated observations bearing on this matter. Attempts to immunize kids by the injection of dried *T. rhodesiense* were not very satisfactory, as the animals suffered from intercurrent infection.

A number of chemotherapeutic observations were made. Treatment of large animals infected with *T. brucei* or *T. congolense* by the bites of infective flies rarely resulted in cure. A very interesting experiment in a horse infected with *T. brucei* and cured by old salvarsan and 5 intramuscular injections of trixidin (antimony trioxide in oil) showed that shortly after the cure the existing antibodies may disappear from the blood. It was noticed that a strain of *T. congolense*, which was curable by Surfen (6678) in 1930, had, after 116 mouse passages, developed a certain degree of Surfen-resistance.

Experiments were undertaken to ascertain how soon after the infective bite trypanosomes could be demonstrated in the blood of the vertebrate. Flies were fed on two calves and 18 and 24 hours later 20 cc. of their blood was injected into monkeys; the monkeys became infected, thus showing that the calves had trypanosomes in the peripheral blood 18 hours after the infective bite.

The question of the development of trypanosomes in *Glossina* is discussed in some detail, but without any addition to knowledge

except for one very interesting observation. Whilst dissecting a number of flies one was found with a heavy infection of the proboscis and gut; unfortunately, only one of the salivary glands was obtained and this was free from trypanosomes. During the attempt to discover the other salivary gland a thread of tissue was withdrawn from the thorax; this thread did not contain blood and was not salivary gland or duct. What exactly it was is not clear, but the interesting discovery was made that it contained countless long developmental trypanosome forms. From this Schilling concludes that perhaps trypanosomes may develop in other organs than the gut and salivary glands. [Possibly the thread may have been the duct of the sucking stomach.] The developmental forms of the various species of trypanosome in *Glossina* are described; these are figured, as are also certain curious forms, the significance of which is uncertain.

It was observed that the repeated intravenous injection into a horse of a dead trypanosome suspension from rat blood may produce a fatal anaphylactic shock. The kid of an infected mother was not infected, but its blood contained antibodies. W. Y.

LOURIE (E. M.) & O'CONNOR (R. J.). **The Dissociation of Antibody from Sensitized Trypanosomes.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 541–544.

In this note the authors explain a phenomenon to which reference is made in their previous communication [this *Bulletin*, 1937, Vol. 34, p. 123]. They have succeeded in demonstrating that antibody which is bound to trypanosomes dissociates when the sensitized trypanosomes are allowed to stand in the absence of complement; and that the dissociation takes place much more quickly at 37°C. than at room temperature (17°–19°C.). W. Y.

PATEL (Chhotu). Ueber die physikalische und chemische Beeinflussbarkeit von Trypanosomen im Hinblick auf das Vorkommen abgeschwächter Erregerstämme. [**The Production of Attenuated Strains of Trypanosomes by Physical and Chemical Influences.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Dec. 7. Vol. 89. No. 5. pp. 325–361. With 2 figs. [25 refs.]

After giving a summary of previous work on this subject the author passes to an account of his own experiments on the influence of various physical factors on trypanosomes. As he was in a position at the Freiburg Skin Clinic to study all kinds of rays under exact conditions, he began his investigation by examining the effect of Röntgen rays and ultraviolet rays on trypanosome suspensions. He found that there was a remarkable difference in the dose of these rays necessary to produce the same result. Enormous doses of Röntgen rays produced no morphological changes and no loss of virulence, whilst minimal ultraviolet radiation proved fatal. Exposure of the trypanosome suspension to the direct rays of the sun for 20 minutes proved fatal, but trypanosomes exposed to the rays for 10 to 15 minutes infected mice in much the same way as the control suspension.

LAVERAN and MESNIL showed long ago that trypanosomes were very sensitive to high temperatures; they were quickly killed at 42°C.–43°C., but they survived for 3 hours at 40°C. and for 1 hour at 42°C. In contrast Patel found that a temperature of 37°C.–38°C.

for 30 minutes killed the trypanosomes. He is unable to explain this remarkable difference. [In all probability it lies in the nature of the suspension. The reviewer and his colleagues have shown that a trypanosome suspension can be kept undamaged for much more than 24 hours at 37°C. If the medium in which the trypanosomes are suspended is unsuitable—either in respect of protein or glucose content—the parasites die quickly at 37°C. and even at considerably lower temperatures. Probably this criticism applies to all Patel's *in vitro* experiments.] The trypanosomes withstand low temperatures better; exposure at 0°C. for 90 minutes does not destroy their infectivity.

The galvanic stream in minimal doses destroys the trypanosomes. A long series of experiments were conducted to ascertain the effect of various concentrations of sodium chloride. Exposure to a solution of 0.3 per cent. NaCl for an hour did not affect the motility or the virulence of the parasite; they also survived exposure to 0.2 per cent. NaCl for 20 minutes, and to 5.0 per cent. for up to 30 minutes. Other experiments dealt with the action of acids and alkalis.

The paper closes with certain observations on the action of salvarsan and paraformosan on infected mice and rabbits. W. Y.

BOVET (D.) & MONTEZIN (G.). Sur l'aptitude remarquable que possèdent différents médicaments arsenicaux à produire des races de trypanosomes résistants. [**The Remarkable Capacity possessed by Various Arsenicals to produce Resistant Strains of Trypanosomes.**]*—Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 68–75.

After giving a brief summary of recent work on drug-resistance, the authors state that they propose to record experiments dealing with the problem how drug-resistance is established and with the aptitude of different aromatic arsenicals to produce resistant strains of trypanosomes.

YORKE and his colleagues have shown that strains of trypanosomes made resistant to atoxyl, arsacetin, tryparsamide, halarzol, novarsenobenzol, stibenyl, and trypaflavine, respectively, are not only resistant to the compound used to provoke resistance, but also equally resistant to all the other commonly employed aromatic compounds of arsenic and antimony and to trypaflavine.

The authors have examined the question of the speed with which various aromatic arsenicals produce resistant strains. In their work they have used atoxyl, orsanine, tryparsamide, Fournau 189 (3 amino-4-oxy-phenylarsinic acid) and also two other compounds described by FOURNEAU, *viz.* F.683 (hydroxymethyl-3-amino-4-phenylarsinic acid) and F.722 (hydroxy-2-hydroxymethyl-4-phenylarsinic acid). Their technique was as follows:—Mice infected with an old laboratory strain of *T. brucei* (Mesnil) were treated with a half or a third of the curative dose of the drug to be examined, so that a relapse occurred between the 5th and 10th day after treatment. The relapse trypanosomes were then inoculated into a series of mice and the minimum curative dose of the drug used, and also of orsanine, determined.

Details are given of an experiment which showed that a single dose of atoxyl (1 mgm. per 20 gm. mouse) failed to produce any recognizable degree of resistance on the part of the trypanosome either to atoxyl or

to orsanine. Another experiment, however, shows that a single dose of F.683 (10 mgm. per 20 gm. mouse) produced great resistance both to F.683 and to orsanine. It was finally shown that whereas a single dose of orsanine, F.189, and tryparsamide failed, like a single dose of atoxyl, to produce any resistance, a single dose of F.722 produced great resistance like a single dose of F.683.

In a table the minimum effective dose and the minimum toxic dose of each of the drugs used are given. The authors conclude that different drugs, closely related chemically, exhibit very different aptitudes to provoke arsenic-resistance. The production of resistance is not proportional to the amount of the arsenical injected, nor to the arsenic content of the drug.

W. Y.

LAUNOY (L.). Le pouvoir infectieux du sang chez les souris infectées par "*Trypanosoma congolense*" et traitées par le 205-309 [Moranyl]. [**The Infective Power of the Blood of Mice Infected with *T. congolense* and treated by Moranyl.**—*Bull. Acad. Méd.* 1936. Dec. 22. 100th Year. 3rd Ser. Vol. 116. No. 40. pp. 867-870.]

Moranyl in large doses clears the blood of mice infected with *T. congolense*, but about 90 per cent. of the animals relapse in 5 to 7 days. The question the author has attempted to solve is whether the blood in the negative period is really sterile. He refers to the previous work of NICOLLE, who showed that after a dose of 4 mgm. per 20 gm. of mouse infected with *T. congolense*, microscopic examination of the blood was negative from the 23rd hour to the 5th day, and that subinoculation of the blood into normal mice failed to produce infection between the 31st hour and the 3rd day. NICOLLE also sought to ascertain in which organs the surviving parasites took refuge, but in this he failed [this *Bulletin*, 1933, Vol. 30, p. 790].

Launoy assembles in a table numerous similar experiments performed by himself between May 1933, and November 1936. His infected mice were all treated with 5 mgm. per 20 gm. of moranyl; and at various intervals afterwards, varying from 15 hours to 120 hours, normal mice were injected intravenously or intraperitoneally with the heart blood of the treated animals. The table shows that the sub-inoculations made 45 hours after treatment were all negative, whereas those done before and after this period always gave a number of positive results. Broadly speaking, the percentage of positive inoculations increased as the distance from 45 hours increased; thus all the inoculations done between the 15th and 23rd hours were positive, as were almost all those done between the 87th and 120th hours.

W. Y.

STRÖDER (Josef). Ueber die Beeinflussung einer experimentellen Trypanosomeninfektion durch Begleitinfektionen. [**The Influence of Concomitant Infections on Trypanosome Infections.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Nov. 3. Vol. 89. No. 3/4. pp. 161-177. [37 refs.]]

After giving a brief summary of the observations of previous workers on the influence of concomitant infections on the course of trypanosomal infections, Ströder describes certain experiments performed by himself. He used both mice and rabbits infected with the Braun-Teichmann strain of trypanosomes; as concomitant infections the

author employed either *Spirillum morsus muris* (Sodoku) or *Sp. recurrentis*.

It was found that Sodoku exerted no influence on the course of the trypanosome infection in mice (intraperitoneal inoculation) or on that of rabbits (subscrotal inoculation). The trypanosomal infection was influenced by superinfection with *Sp. recurrentis*, but only when the latter infection was given when the trypanosomes in the blood were scanty. When mice suffering from the primary attack of relapsing fever were superinfected with trypanosomes, the latter infection was inhibited so long as the spirochaetes were present in the blood.

W. Y.

V. VÁSÁRHELYI (J.). Besteht ein Parallelismus zwischen der trypanoziden und der spirochätöziden Wirkung der Arsenobenzolpräparate? [**Is there a Parallelism between the Trypanocidal and Spirochaetidal Action of Arsenobenzol Compounds?**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1937. Feb. 20. Vol. 90. No. 1. pp. 19–28. [20 refs.]

The author examined the therapeutic activity of two arsenobenzol preparations on experimental syphilis of rabbits, the trypanocidal activity of one of these substances (Preparation B) was only 60 per cent. of that of the other (Preparation A). The experiments showed that the substance which had the weaker trypanocidal action had also a weaker action in rabbit syphilis.

W. Y.

MELLANBY (Kenneth). **Experimental Work with the Tsetse-Fly, *Glossina palpalis*, in Uganda.**—*Bull. Entom. Res.* 1936. Dec. Vol. 27. Pt. 4. pp. 611–632. With 2 figs. & 1 plate. [14 refs.]

An account is given of laboratory experiments made with *G. palpalis*, dealing mainly with the effects of climatic conditions, temperature and humidity in particular, and on the metabolism and life cycle. The work was done in 1935–1936 at the Human Trypanosomiasis Institute, Entebbe, and also during visits to tsetse areas in Kenya and Tanganyika. The following summary is given:—

“The general conclusion arrived at after examining the results obtained by subjecting *Glossina palpalis* to different humidities is that though excessive desiccation is harmful, yet the fly is able to withstand far drier conditions than it is ever likely to meet in the field. It appears unlikely that, for instance, the seasonal fluctuations in numbers round Lake Victoria are due to harmful effects of the dry season. There is also no evidence that very moist air is itself harmful.

“Experiments to determine the time flies could survive without food under various conditions of temperature and humidity showed that the rate at which water is lost is fairly slow, so that except in very dry air flies die from starvation before desiccation proves fatal.

“Breeding in the laboratory is unsatisfactory, because of difficulties in persuading flies to feed regularly.

“The readiness with which flies feed, and the amount of blood which they take, is not affected by humidity.

“The rate of metabolism is the same in dry and moist air. In dry air water is lost more rapidly than in moist, which upsets the dry-matter : water ratio, but a blood meal contains so large an excess of water that it can replace any deficiency. It is possible to show that *G. palpalis* exhibits a regular hunger cycle, in which the hungry fly has an empty gut and a small fat-body. Two days or so after feeding the gut is nearly empty, and the

fat-body is at its maximum size. Then the fat decreases and the fly becomes hungry once more. It is only when the air is very dry that death occurs from desiccation before the fat has all been metabolised (when normally the fly becomes hungry and seeks food). *G. palpalis* can withstand one hour at 41°C. in moist air, and can cool itself by evaporation sufficiently to withstand 42°C. in dry air. It can withstand 39°C. for 3 hours in air of all humidities. These temperatures are above those occurring within its normal range.

"It is possible to see living sperm in the spermatheca of a fertilised female tsetse. Even in the presence of males, females in laboratory cultures may avoid fertilisation for many weeks. The process of copulation is described. The presence of a high proportion of males does not cause abortion, for pregnant females are not persistently pestered.

"Flies are not active, nor do they seek for food even if hungry, at temperatures below 21°C. Between 21° and 13°C. they can fly if disturbed, and between 13° and 8°C. they crawl or kick. Below 8°C. they are completely immobilised, though even after 3 hours at that temperature they can feed within 2 minutes of transference to 25°C.

"Hungry flies are more active than those which are not. Increased light intensity and a raised temperature promote activity. Flies seem to be attracted by light, and there is an optimum light intensity, which is about a third the intensity of sunlight.

"Pupae develop best in moist air. In fairly dry air adults are unable to escape from the puparia. In all places where I found wild pupae, the air in the soil spaces was saturated, though the soil appeared to be dry.

"The active larvae show no reaction to light."

W. Y.

MELLANBY (Helen). **Experimental Work on Reproduction in the Tsetse Fly, *Glossina palpalis*.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 131–141. With 2 figs. [10 refs.]

The object of the work described in this paper was to ascertain the effect of temperature, humidity and nutrition on the reproductive cycle of the female *G. palpalis*. The author summarizes her observations as follows:—

"1. The reproductive cycle of the female fly was worked out at an average temperature of 24°C. The lowest egg of the right ovary develops first, and is ripe in 7 days. Ovulation never occurs earlier than the 8th day, and frequently later; it bears some relation to fertilization, for eggs in virgin females failed to ovulate for weeks. The first larva was produced in a variable time after fertilization (because of delayed ovulation), but the succeeding larvae were produced very regularly, with an average period of 9.9 days between them.

"2. Pupae produced in the laboratory usually weigh less than those collected in the field. The reason for this is nutritional, and flies must take large meals at the right stage in gestation to produce large pupae. It is impossible to ensure that this happens with all flies in the laboratory.

"3. Abortions are caused in captivity by flies obtaining too little blood. They may be induced in pregnant females by allowing them to take only small meals, when either an egg or a small larva is extruded. When these flies were properly fed later, they produced normal larvae.

"4. A constant temperature of 30°C. causes sterility in females. Ovaries develop abnormally, embryos fail to hatch from eggs, but young larvae (in the uteri) are not adversely affected.

"5. A constant temperature below 22°C. slows down the rate of development of the eggs in the ovaries and lengthens the larval period. Experiments at this temperature are complicated by inactivity of males, which leave many females unfertilized. The length of the combined embryonic and larval periods is 17½ days.

" 6. Experiments performed outside in the laboratory compound suggest that the period between each larva in the field (during December in Uganda) will be about 13½ days (min. temp. 16°C. ; max. temp. 27°C.).

" 7. Flies appear to be able to breed equally well with relative humidities of 47, 88 and 100 per cent. In the drier air care must be taken with feeding, or the flies die from desiccation.

" 8. A temperature of 20°C. can cause pregnant females to retain their larvae for an extra 12 hours, but not longer."

W. Y.

MELLANBY (Kenneth). **The Reproductive Cycle in *Glossina morsitans* and *Glossina swynnertoni*.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. p. 142.

During a visit to Tanganyika the author was able to investigate the reproductive cycles of *Glossina morsitans* and *G. swynnertoni* and compare them with the cycle in *G. palpalis*. After comparing his results with those of Mrs. H. N. MELLANBY on *G. palpalis*, the author writes :—

" The main significance of these results is that these three different species should behave almost identically ; it is therefore probable that all species of tsetse have a similar reproductive cycle. This information may be of some importance in assisting field investigations of the reproduction of the various species."

W. Y.

CORSON (J. F.). **Experimental Transmission of *Trypanosoma gambiense* by *Glossina morsitans* through Monkeys.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 389-400.

Corson considers here the question whether the characters of a trypanosome can be modified by passing it through a species of *Glossina* other than that which naturally transmits it. STEPHENS and FANTHAM (1910), when describing *T. rhodesiense*, wrote that possibly it might be a variety of *T. gambiense* due to some change of environment, and that its peculiar morphology might be the result of its having been conveyed by species of *Glossina* other than *G. palpalis*. The only experimental evidence in support of the idea that *T. rhodesiense* has been produced by the passage of *T. gambiense* through a species of *Glossina* other than *G. palpalis* is that given by KLEINE (1928), who wrote : " Moreover, W. Fisher (1913), on Lake Tanganyika, reported to me on the strikingly rapid death of monkeys which he had infected there by means of *G. morsitans* with *T. gambiense*. I regret that we did not pay more attention to these experiments." LESTER (1935) transmitted a strain of human trypanosomes through a series of 25 *G. tachinoides*, and the same strain in a parallel experiment, through a series of 7 *G. submorsitans* and found no significant difference between the trypanosomes of the two series of transmissions. At least 10 years ago it was recommended that *T. gambiense* should be transmitted repeatedly by *G. morsitans* and *T. rhodesiense* by *G. palpalis*.

In July 1934, Corson received from Entebbe a strain of *T. gambiense* in a monkey and two guineapigs. The monkey had been infected by *G. palpalis* in April 1934, from another monkey which had been infected from a case of sleeping sickness on March 15th, 1934. The strain had been found at Entebbe to have a low virulence and infectivity, and was not easily transmitted there, inoculation of monkeys

sometimes failing to infect them. Transmission by *G. morsitans* was begun about the middle of September 1934, and was continued from monkey to monkey by boxes of flies without any attempt to isolate the infective flies. The series of transmissions by flies is shown in a plan, from which it appears that the experiments lasted from September 1934, until May 1936, and that the trypanosome was transmitted in this way through a series of 8 monkeys (*Cercopithecus* sp.). Details of the course of the infection in the various monkeys and of the results of inoculations into laboratory animals are given in a number of tables. So far as could be judged no increase in virulence took place during the eight passages. W. Y.

CORSON (J. F.). **Are Experiments with Trypanosomes in Laboratories in Tropical Africa vitiated by Accidental Infections?**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 309-312.

In this article Corson considers the question whether in tropical Africa animals kept for use in experiments for trypanosomes may fail to be reliable owing to their being accidentally infected with trypanosomes. Two possibilities seem to exist. Firstly, that native oxen, sheep, goats, dogs, fowls and wild animals may have a chronic infection caused by the bites of wild tsetse flies in areas in which they have lived for some time, and that the chronic infection may escape detection. Antelopes, unless they are born on the laboratory premises or in some other place situated many miles from tsetse flies, cannot be regarded as free from a natural infection, and this applies especially to the more resistant kinds in which infection may be hard to detect.

The second cause of error may be mechanical infection. In laboratories where *Tabanidae* and *Stomoxys* are at times plentiful, as at Tinde, the question of mechanical infection requires consideration.

After reviewing his own observations on this matter Corson concludes:—

"It seems that confidence may be placed in the trustworthiness of experiments with human trypanosomes in laboratories in tropical Africa if they are situated in open country several miles from wild tsetse flies, and if tsetse flies are not repeatedly introduced by trains or motor cars. At the present time, however, with the establishment of aerial transport, much of the work which had to be done formerly in sleeping sickness areas of tropical Africa, can be carried out in places where no fear of accidental infection by biting flies need be entertained."

W. Y.

IRIARTE (David R.). **Contribución al estudio de la enfermedad de Chagas en Venezuela.** [**Study of Chagas's Disease in Venezuela.**]—*Gac. Méd. de Caracas.* 1936. May 31, June 15, 30 & July 15. Vol. 43. Nos. 10, 11, 12 & 13. pp. 149-159; 161-170; 183-189; 194-206. With 44 figs. [79 refs.]

This article, or series of articles, does not permit of abstract. It deals with several aspects of the subject: the correct nomenclature of the parasite, whether *Schizotrypanum* or *Trypanosoma*, description of cases, acute and chronic, and their pathological histology, also of

animals inoculated and their electrocardiographic tracings, xeno-diagnosis, and the insect transmitters. The following summarizes the author's main conclusions :—

1. Chagas's disease is as much an endemic infection in Venezuela as malaria and ankylostomiasis and more serious because treatment is not satisfactory.

2. Many of the patients from the plains suffering from cardiac affections are probably instances of this disease since they do not respond to the usual treatment of cardiac conditions.

3. In certain parts of the country the percentage of infected insects (*Rhodnius*) was very high; of 24 collections from different districts some showed as many as 60 per cent. positive.

4. The author thinks that *Schizotrypanum* should stand rather than *Trypanosoma* as the generic name of the parasite.

5. In Zaraza, where the percentage of positive *Rhodnius* was so high, examination of 12 boys living in straw huts and also of the blood of "a few domestic animals" failed to reveal any positive cases.

6. A patient giving a positive W.R. and Kahn reaction, with cardiopathy ascribed to syphilis, having died, his heart was examined and leishmanial forms were found in the myocardium.

7. Four species of Reduviid bug are found in the country: *Eutriatoma maculata*, *Rhodnius prolixus*, *Panstrongylus geniculatus* and *Spiniger rubropictus*. The first is very common, but was not found infected in nature nor could it be infected experimentally. The chief transmitter is *Rhodnius prolixus*.
H. H. S.

MAZZA (Salvador) & BENITEZ (Clemente). Segundo caso de forma aguda de enfermedad de Chagas comprobado en Corrientes. [**Second Acute Case of Chagas's Disease in Corrientes.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 13–22. With 9 figs.

The patient was a well-built man of 18 years presenting marked oedema of the lids of the left eye with enlargement of the corresponding glands and also some exophthalmos and granulations on the tarsal conjunctiva of the lower lid. The authors were particularly struck by the condition they describe as dacryo-adenitis [inflammation of lachrymal gland] which was marked and persistent, being still noticeable 3 months after the onset of symptoms.
H. H. S.

MAZZA (Salvador), IDELSOHN (Francisco) & PARCERISA (Pedro J.). Segundo caso de forma aguda benigna de enfermedad de Chagas comprobado en Entre Ríos.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 23–28. With 4 figs.

MAZZA (Salvador) & CASTRO RENDÓN (Eduardo). Comprobación de forma aguda benigna de enfermedad de Chagas en Neuquén.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 30. pp. 3–4.

DIOS (R. L.), DE SOMMERVILLE (E. T. W.), BONACCI (H.) & ALDAO (J. F. A.). Indices de infestación del *Triatoma infestans* en la R. Argentina. [**Proportions of *Triatoma infestans* found infected in Different Districts of the Argentine.**].—*Rev. Inst. Bacteriológ.* Buenos Aires. 1936. Nov. Vol. 8. No. 1. pp. 13–141. With 13 maps & 4 graphs. [7 pages of refs.]

It is impossible to abstract this long article; those who are interested must consult the original. The question is an important one because the prevalence of Chagas's disease is not known with any certainty and the determination of those places in which infected *Triatoma* are found affords presumptive evidence that human infection may be expected to occur. The authors have examined over 30,000 specimens, male and female, imago, nymph and larva. They cut the posterior extremity, then press out the internal organs by means of a needle from before backwards, dissect them on a slide, stain by Papenheim's method and examine. They note the parasitic prevalence in the different provinces and deal with each separately, stating the districts where infected bugs have been found and the stage of development. A small subsection deals with xenodiagnosis. The whole is well documented, over 400 references are appended.

H. H. S.

MAZZA (Salvador), MONTAÑA (Armando), BENÍTEZ (Clemente) & JANZI (Edim Z.). Transmisión del *Schizotrypanum cruzi*, al niño por leche de la madre con enfermedad de Chagas. [**Transmission of Infection of *T. cruzi* to an Infant by the Mother's Milk.**].—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 41–46. With 1 fig.

NATTAN LARRIER in 1913 demonstrated that *T. cruzi* might be found in the milk of women experimentally infected.

The present paper gives an account of a woman of 30 years, living in Makallé (Chaco), who in January 1936, showed symptoms of Chagas's disease. Two months later she was confined; no parasites could be seen in the child's blood when 10 days later they left Makallé for Resistencia (Corrientes) where they have since lived. Eleven weeks later, mother and daughter were again examined. The blood of the latter contained many trypanosomes, there had been diarrhoea, and enlarged glands, the size of maize grains, at the occiput and in neck, axillae and groins, with enlargement of liver and spleen and a rapid unequal pulse; no swelling of lids, or cutaneous lesions found anywhere. In Resistencia the vector of *T. cruzi* is not seen. Examination of the mother's milk on the same day discovered three *T. cruzi* in the centrifuged deposit, and again 6 days later, though none was seen in thick blood drops.

H. H. S.

OLLE (Rodolfo G.). Síntomas oculares de la enfermedad de Chagas. Su significación diagnóstica. [**The Diagnostic Value of Ocular Symptoms in Chagas's Disease.**].—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 30. pp. 30–49. With 7 figs. [28 refs.]

The author gives details of nine cases of Chagas's disease in which swelling of one eye (occasionally both) occurred as an early symptom

and sufficiently characteristic to be of diagnostic value. The condition goes by the name of Trypanosomal unilateral conjunctivitis (conjunctivitis schizotripanósica unilateral) and has the following characters:—

1. Starts abruptly with swelling of lids and conjunctiva and disappears slowly.
2. There is painless oedema, of reddish-violet colour.
3. Injection of conjunctiva may amount to chemosis.
4. The swelling extends to the face.
5. Corneal affection is absent.
6. Conjunctival secretion is scanty.
7. Preauricular, parotid or submaxillary gland of the same side usually enlarged.

In a table of findings, the swelling appeared earliest on the sixth day of disease [at least that was the day on which examination was made] and the trypanosome was found by direct examination of the blood ten days later. The illustrations show the condition as clearly as any uncoloured photograph can.

H. H. S.

MAZZA (Salvador) & BENÍTEZ (Clemente). Investigaciones sobre la enfermedad de Chagas. I. Comprobación de la naturaleza esquizotripanósica y frecuencia de la dacrioadenitis en la enfermedad de Chagas. Presencia de granulaciones tarsales en la forma ocular de esta enfermedad. [**The Trypanosomal Nature of the Dacryoadenitis in Chagas's Disease.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 31. pp. 1-31. With 31 figs.

This article is based on a study of eight cases of Chagas's disease presenting the early ocular symptoms; five were shown to have the trypanosomes in their blood, three were confirmed by a positive Machado reaction. Histological examination showed sparse granulations over the lower tarsal conjunctiva with giant-cells, and the trypanosomal nature was proved by finding leishmania forms in the deeper parts. Photomicrographs demonstrate the changes set up.

H. H. S.

MAZZA (Salvador) & OLLE (Rodolfo). Particularidades de dos casos de enfermedad de Chagas. [**Two Cases of Chagas's Disease with Unusual Symptoms.**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 1-12. With 12 figs.

The authors remark that Chagas has described cases of American trypanosomiasis with ocular complications, even to secondary panophthalmitis with suppuration and total destruction of the eye. The two here described were not so serious as that, but presented ocular symptoms not usually observed.

The first was a girl of 5 years, who showed a painless oedema of both lids of the left eye, no suppuration, but slight exophthalmos with a convergent squint "not paralytic, all the ocular movements being maintained." No other ocular abnormality except a slight congestion of the conjunctiva was detected. Trypanosomes, though scarce, were seen in thick drops of the peripheral blood. The spleen was enlarged "appreciably." Three and a-half months after the onset

parasites were no longer seen in the blood, but the spleen was still enlarged and the liver now also. There was no exophthalmos and the strabismus was transient only and at intervals. In another fortnight all signs had disappeared.

The second patient was a man of 33 years whose initial symptoms of headache and general pains had led to a diagnosis of influenza, but 4 days later marked oedema of the lids of the left eye appeared with disturbance of vision, but no pain. The spleen was "enlarged appreciably and could be felt below the costal margin." A swollen pre-auricular gland was excised, and showed marked histiocytic hyperplasia, these cells containing many leishmania forms; the gland cells appeared little if at all affected. The symptoms cleared up in about 5 weeks. It is noted that the general disturbance preceded by fully 10 days the onset of the ocular symptoms. *H. H. S.*

COUTO (Miguel), Jr. Lesões do sistema específico do miocardio num caso de tripanozomíase americana. [**Myocardial Lesions in American Trypanosomiasis.**].—*Hospital*. Rio de Janeiro. 1936. Nov. 8th Year. Vol. 2. No. 11. pp. 1223-1227. With 4 figs.

The author gives a general sketch of the cardiac arrhythmias which may occur in Chagas's disease and describes briefly an illustrative case in his own practice. This was a young man of 18 years from a part of Minas infested with *Triatoma*. When first examined he presented a bradycardia, 46 per minute, and occasional extrasystoles. Later [how long afterwards is not stated] heart-block became more manifest and the Stokes-Adams syndrome appeared, 28 pulsations per minute. Two years after he had first come under the author's care he suddenly complained of violent pain in the heart, and was dyspnoeic, exhibiting the symptoms of infarct of the heart and death occurred soon after. Sphygmographic tracings are reproduced in the paper. *H. H. S.*

MAZZA (Salvador), ROMAÑA (Cecilio) & PARMA (Bartolome). Caso agudo de enfermedad de Chagas con lesión cutánea de inoculación.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 29-33. With 2 figs.

MAZZA (Salvador), ROMAÑA (Cecilio) & ZAMBRA (Eduardo R.). Comprobación de lesión cutánea de inoculación en un caso de enfermedad de Chagas.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 34-40. With 7 figs.

MAZZA (Salvador), BENITEZ (Clemente) & BENITEZ (Jose). Diagnóstico retrospectivo de enfermedad de Chagas, forma aguda, por examen anatomopatológico de ganglio axilar.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1936. Publicación No. 28. pp. 47-53. With 7 figs.

BONNE (C.). Over de Crithidiën van *Triatoma rubrofasciata* de Geer. [**Crithidia of *Triatoma rubrofasciata*.**].—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1936. Sept. 29. Vol. 76. No. 39. pp. 2483-2486.

In a previous paper the author has shown that the flagellates of the crithidia type which occur commonly in the intestine of *Triatoma*

rubrofasciata produce a trypanosome infection when inoculated to mice. It may be difficult, however, to see the trypanosome in the blood of the infected mice but clean bugs fed on the mice readily become infected (the xenodiagnostic method of diagnosis of BRUMPT). Attempts were made to find the real vertebrate host of the bug flagellate. Bugs were fed on rats infected with *Trypanosoma lewisi* but no infection resulted. However, bugs fed on one rat, the blood of which showed no trypanosomes on microscopic examination, acquired an infection indistinguishable from the naturally occurring flagellate infection. These flagellates inoculated into mice gave rise to a trypanosome infection like that produced by the naturally occurring bug flagellate. By the method of xenodiagnosis two other rats were found to be infected, though blood examinations were negative. In view of MALAMOS' discovery in a monkey of a trypanosome of the *T. cruzi* type bugs were fed on man and monkeys with the hope of revealing some hidden infection of the *T. cruzi* type, but with negative results. The author concludes that the naturally occurring flagellate in *Triatoma rubrofasciata* is not *T. cruzi*, as the trypanosomes which appear in mice are not of the *T. cruzi* type, while developmental forms in the tissues like those associated with *T. cruzi* infections in mice are not found.

C. M. Wenyon.

LEISHMANIASIS.

GIRAUD (Paul). Epidémiologie du kala-azar dans la région marseillaise. [**Epidemiology of Kala Azar in the Marseilles District.**—*Marseille-Méd.* 1936. July 25. Vol. 73. No. 21. pp. 81-92.

Writing of kala azar in the district of Marseilles, the author notes that the disease became apparent in 1922, since when about 146 cases have been recorded, of which 135 were autochthonous. Of the 146 cases, 5 were in adults and 4 in adolescents, the rest being in children. The endemic area does not extend west of the Rhone, while to the east it is continuous with other endemic foci up to the Italian border. In a northern direction 100 kilometres is its limit. In the Marseilles region particularly the dry, scrubby districts are those most affected and it is in these regions also that "fièvre boutonneuse" is most common. This disease is admittedly conveyed from dog to human being by the tick, and the author thinks that a similar mode of infection may occur in the case of kala azar. He puts aside any idea of direct contagion from case to case and, though admitting that sandflies are common in the kala azar districts, he observes that they are by no means limited to or most abundant there. Furthermore they feed upon adults as well as children, which is not the case with dog ticks, which readily attack the children of the poor who, in these areas, live most of their young days out of doors and in close contact with the ground. The author admits that proof of tick transmission has not yet been obtained, but he thinks that further work on the subject should be carried out. It appears that the incidence of infection in dogs is very high and that they are to be regarded as reservoirs of the leishmania infection. In fact the disease in dogs came to light in this district some years before human cases began to be discovered.

C. M. Wenyon.

D'OELSNITZ. Le kala-azar autochtone de l'adulte. [**Autochthonous Kala Azar in the Adult.**—*Bull. Acad. Méd.* 1936. Oct. 13. 100th Year. Vol. 116. No. 30. pp. 207-209.

During the past fifteen years the author has seen over a hundred cases of kala azar in children in a certain section of the Mediterranean littoral of France. In the same period fifteen cases in adults have been observed and of these twelve were certainly autochthonous. The disease has presented the usual features. The author advocates sternal puncture for the preparation of bone marrow smears as a diagnostic procedure preferable to and more reliable than other methods.

C. M. W.

ARCHIBALD (Robert G.) & MANSOUR (Haseeb). **Some Observations on the Epidemiology of Kala-Azar in the Sudan.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 395-400.

The author has already given a preliminary account of his investigations in another publication (this *Bulletin*, 1937, Vol. 34, p. 40). The work described was carried out in two areas—the Fung

district, near the border of Abyssinia and to the west of the Blue Nile, and the Kapoeta district on the Uganda-Kenya border. In both these districts the minimum rainfall is 10 inches, giving a relatively low temperature and high humidity, which appear to be the necessary conditions for the existence of the disease, which is not found in the drier areas of the Sudan. That the disease is fairly common is shown by the recognition of 289 cases in 1934 and 171 in 1935. It is seen mostly in adults and occurs in towns as well as in villages, while housing conditions and state of nourishment do not affect the incidence. It is found quite commonly in the well-housed and well-fed military and police.

Clinically the disease is not to be distinguished from kala azar of other countries. It was noted, however, that cases in the Kapoeta district showed massive infections of the spleen with the regular occurrence of parasites in the peripheral blood, while in the Fung district the infections were less intense and parasites were never found in the blood, in spite of the examination of 320 films from 35 cases.

Leishmania were found in nasal smears of 7 of 35 cases examined. The nasal material from one of these cases produced infection in two monkeys, one by intradermal inoculation, the other by nasal swabbing. As the nasal swabbing might have damaged the nasal mucosa, an attempt was made to infect another monkey by spraying with a scent spray on to the nasal mucosa a liquid containing leishmania. The monkey was found infected 99 days later. No evidence could be obtained that healthy persons in contact with kala azar cases harboured leishmania in the nasal or tonsillar mucosa.

A large number of animals, including dogs, were examined but no evidence of leishmania infection was found. Insect surveys yielded amongst blood suckers mosquitoes, bugs, lice, ticks, fleas and sandflies, the last named including *Phlebotomus papatasi* and *P. perniciosus*.

Certain interesting contact experiments with monkeys were carried out. In one, four healthy monkeys were kept together in an insect-proof room with four older monkeys inoculated intraperitoneally with kala azar material. The four inoculated animals acquired kala azar, as also did two of the others which were found infected on the 85th and 87th day of the experiment. The experiment was repeated, with the result that three of the uninoculated monkeys were found infected 104, 104 and 113 days later. No opinion is expressed as to how infection occurred. As a prophylactic measure it is suggested that intensive inspection of the population in May and June each year, with a view to the detection and treatment of as many cases as possible, would reduce the number of cases carrying over from one year to another and so lower the incidence in the following season. This is based on the assumption that the new infections occur in the period July to October, when there exists the necessary humidity, the rest of the year being dry and arid as in the northern parts of the Sudan where kala azar does not occur.

No definite statement regarding the method of transmission is made. It is concluded that the problem of transmission of kala azar in the Sudan, as in other countries, still awaits solution. Nevertheless, it seems that the authors incline to the view that direct case-to-case infection occurs. Various speakers in the discussion which followed the presentation of the paper argued in favour of sandfly transmission, which it was maintained had been almost if not completely established in other countries.

C. M. W.

- DA CUNHA (A. Marques) & CHAGAS (E.). Etudes sur la leishmaniose viscérale du Brésil. Vérification du parasite par ponction de la rate et du foie ; culture et aspect morphologique ; considérations d'ordre général. [*Visceral Leishmaniasis in Brazil. Parasites found by Spleen Puncture ; Culture, Morphology, General Considerations.*—*C. R. Soc. Biol.* 1936. Vol. 123. No. 31. pp. 709-711. With 3 figs.
- CHAGAS (E.). Leishmaniose visceral americana. (Nova entidade morbida do homem na America do Sul.) [*Visceral Leishmaniasis a New Morbid Entity of Man in South America.*—*Hospital.* Rio de Janeiro. 1937. Feb. Vol. 11. No. 2. pp. 145-147. English summary (2 lines).
- DA CUNHA (A. Marques) & CHAGAS (E.). Nova especie de protozoario do genero leishmania pathogenico para o homem. *Leishmania* Chagasi, n. sp. [*New Species of Leishmania Pathogenic for Man.*—*Ibid.* pp. 148-152.
- CHAGAS (E.) & CASTRO (Gustavo de Oliveira). Nova systematisção das leishmanioses. [*New Classification of the Leishmanias.*—*Ibid.* p. 153. English summary (2 lines).

These four papers relate to the occurrence of kala azar in Brazil. The examination for evidence of yellow fever of pieces of liver taken by viscerotomy post-mortem from a large number (about 70,000 up to November 30, 1935) of cases which had died of some undiagnosed fever had revealed leishmania infection in 70. This led to a search for actual cases of kala azar, the first of which was noted by the present author in 1936 (this *Bulletin*, 1936, Vol. 33, p. 500). In the four papers now under review four cases are mentioned, in three of which parasites were found by spleen puncture. From one of the cases brought into hospital at the Oswaldo Cruz Institute cultures of the parasite were obtained, its morphology studied and animal experiments instituted. The parasite apparently resembles *Leishmania donovani* and the disease kala azar, nevertheless, because of certain differences obtained with various sera in agglutination and absorption tests which, however, are notoriously unreliable with leishmania, it is concluded that a distinct species of *Leishmania*, *L. chagasi*, is involved. Furthermore the arrangement of the three species, or supposed species, of *Leishmania* of the Old World and the diseases they produce in one group and *L. brasiliensis* and the new one of the New World in another group is considered to be a new classification of the leishmaniases.

C. M. W.

- SAITO (Yasuichi). Investigations of the Biological Character of *Leishmania donovani*. II. Report. Resistance of *Leishmania donovani* to Chemical and Physical Environment.—*Jl. Oriental Med.* 1936. Oct. Vol. 25. No. 4. [In Japanese pp. 885-905. [17 refs.] English summary pp. 73-74.]

The paper records the results of experiments to test the degree of resistance of the cultural forms (designated "worms" in the paper) to heat and cold, disinfectants, radium emanations and X-rays, saponin, alkaloids, and sera. The results are given in catalogue form.

C. M. W.

SAITO (Yasuichi). **Investigations of the Biological Character of *Leishmania donovani*. III. Report. Investigations on the Necessity for the Growth of *Leishmania donovani* in vitro.**—*Jl. Oriental Med.* 1937. Jan. Vol. 26. No. 1. [In Japanese pp. 111–138. [36 refs.] English summary pp. 9–10.]

By varying the culture conditions both in and outside the medium the author has arrived at certain conclusions as to the factors which are most favourable to growth. These are given in a catalogue in the paper.

C. M. W.

SANGIORGI (Giuseppe). Vielgestaltigkeit des Virus Donovan. [**Polymorphism in *L. donovani*.**—*Muench. Med. Woch.* 1937. Mar. 5. Vol. 84. No. 10. pp. 365–366.]

In preparations made from the spleen of a case of kala azar the author was much struck by the great variation in size, shape and structure of the leishmania which were present. This appearance, unusual in his experience, leads him to wonder if within the single species *Leishmania donovani* there may not be variants which are responsible for the differences which have been noted in the disease in different districts.

C. M. W.

KHODUKIN (N. J.), SOFIEFF (M. S.) & KEVORKOFF (N. P.). Sur l'identification des différentes souches de leishmanies. (Problème de l'agent pathogène des leishmanioses.) [**Identification of the Different Strains of Leishmania.**—*Ann. Inst. Pasteur.* 1936. Nov. Vol. 57. No. 5. pp. 487–515.]

This appears to be a French version of a Russian paper already noticed in this *Bulletin*, 1936, Vol. 33, p. 506.

C. M. W.

CARONIA (G.). E il flebotomo l'agente trasmissore della leishmaniosi ? [**Is the Sandfly the Vector of Leishmaniasis ?**—*Riv. di Parassit.* Rome. 1937. Jan. Vol. 1. No. 1. pp. 19–29. English summary (8 lines).]

In this paper the author reviews the literature dealing with the method of transmission of kala azar, particularly that describing experiments with sandflies and the attempts at direct infection by way of the mouth. The author, who has had a long experience of kala azar in Italy and Sicily, concludes that though the theory of sandfly transmission seems an attractive one it is not possible to assert that the last word has been said on this controversial subject.

C. M. W.

SMITH (R. O. A.), MUKERJEE (S.) & CHIRANJI LAL. **Bionomics of *P. argentipes*. Part II. The Breeding Sites of *P. argentipes* and an Attempt to control these Insects by Anti-larval Measures.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 557–562.

The observations recorded in this paper were carried out in a village a few miles south of Calcutta in which the incidence of kala azar in the last epidemic had been high. During two years, systematic search was made for adult *Phlebotomus argentipes* in houses and cattle

sheds: they were more plentiful in the latter. Search was also made for breeding places. Practically every sample of soil in which larvae were found was obtained within twenty yards of a house or cattle shed. Spraying breeding sites and the surrounding area with necrosene and with a crude oil and kerosene mixture were tried; this proceeding appeared to have no influence on the numbers of *P. argentipes* found in house or cattle shed. The authors conclude that this species would be more easily controlled, in rural areas, by measures directed against the adult insect, by means of sprays or fumigation, than by anti-larval measures. *Norman White.*

BONAN (Hector) & MAMOU. Sur une forme atypique du kala-azar de l'adulte l'hépatite leishmanienne ictero-ascitique. [**Ictero-ascitic Leishmanial Hepatitis in the Adult.**—*Tunisie Méd.* 1937. Jan. Vol. 31. No. 1. pp. 17-21.

A man 39 years of age became progressively ill with wasting, anaemia and subacute fever combined with enlargement of the spleen and especially the liver. Later there was jaundice, epistaxis, purpura and ascites. The diagnosis was obscure. Malaria was excluded by failure of response to quinine and absence of parasites. Amoebic abscess was suspected but emetin failed to influence the condition. The man's vocation, that of a wine dealer, led to suspicions of alcoholic cirrhosis but no evidence of alcoholic excess could be obtained. Finally a diagnosis of kala azar was suggested. Various serological tests gave indications of the correctness of this diagnosis, which was confirmed, in the authors' opinion, by the rapid response to antimony treatment. The patient had refused spleen puncture. The conclusion is reached that this case illustrates a new clinical type of kala azar in which the main symptoms are attributable to derangement of the liver. *C. M. W.*

D'OELSNIETZ, VIAN (L.) & BARBE (R.). Gros ventre, aménorrhée et masque pigmentaire chez une jeune femme atteinte de kala-azar autochtone. [**Enlarged Abdomen, Amenorrhoea and Pigmentation of the Face in Kala Azar.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1937. Jan. 25. 52nd Year. 3rd Ser. No. 2. pp. 38-41.

This is a long account of an uncomplicated case of kala azar in a young woman in the south of France. Emphasis is laid on the fact that the progressive enlargement of the abdomen, the amenorrhoea and the pigmentation had led the woman to submit to obstetrical examination. It was after the exclusion of any obstetrical cause for her condition that a general medical examination followed by sternal puncture led to a correct diagnosis. A complete cure was effected with neostibosan. A special note is made of the enlargement of the epitrochlear glands, which the authors have previously described as a special feature in cases of this disease. *C. M. W.*

CHORINE (V.). Les réactions sérologiques dues aux euglobulines. [**Serological Reactions due to the Euglobulins.**—*Ann. Inst. Pasteur.* 1937. Jan. Vol. 58. No. 1. pp. 78-124. With 2 figs. [102 refs.] [**Kala Azar** pp. 107-117.]

The author discusses the various serological reactions which depend on the presence in the serum of increased quantities of euglobulin.

As regards the reaction of Henry, advocated for the diagnosis of malarial infection, he is in agreement with WISEMAN (this *Bulletin*, 1935, Vol. 32, p. 130) that the flocculation brought about by the addition to serum of solutions of melanin is due to the distilled water and not to the presence of some anti-melanin substances which have been generated in the body as a response to the continued liberation from malarial parasites of malarial pigment. The presence of melanin in solution merely renders the flocculi more apparent. A very fine suspension of carmine gives even better and clearer results. The reaction is dependent upon an increase in euglobulin and a diminution of the albumin as well as on the presence of fats and free cholesterol, which are insoluble in distilled water. Another similar reaction is that of Vernes in which the reagent is resorcin, which likewise gives a precipitate in serum of tuberculous patients in the presence of excess of globulins. In this case, however, it is a reaction of coagulation and not merely a question of insolubility in distilled water. This action of resorcin is shared by phenols in general, which coagulate both euglobulin and pseudoglobulin, though the former is more concerned in the reaction than the latter. It seems that the euglobulin differs from that in malaria and that they are both distinct from that of normal serum.

It is in kala azar that the euglobulins are most markedly increased, while the albumin is reduced in amount, and this is responsible for the number of reactions which have been devised as tests for the disease. This euglobulin in kala azar serum does not appear to be the same as the euglobulin in normal serum, from which it can be separated by precipitation with 0.4 per cent. sodium chloride solution.

As regards the formol gel reaction it is found that the development of opacity is a different phenomenon from gelification. Thus by fractional precipitation with 2 to 4 per cent. sodium chloride solutions and dialysis against distilled water three grades of euglobulin are obtained. The most insoluble added to normal serum causes gelification with opacity to occur in under an hour in the formol gel test, whereas the addition of either of the other more soluble grades causes gelification to take place without opacity. It seems that the insoluble grade is that one found in kala azar but in any case, for the reactions to succeed, it is necessary for the total euglobulins to be in excess. With this quantity of euglobulin in kala azar serum it is to be expected that flocculation would occur with distilled water, as in Brahmachari's distilled water test. The phenols, of which resorcin is one, also gave precipitation, as they do in Vernes' tuberculosis test. Phloroglucin acts like phenol, as does tannin. It seems that the tests in which organic antimony compounds are used, such as the urea stibamine test of Chopra and the similar one of Nattan-Larrier, depend not on the antimony present but on simple alcohol or phenol groups. It may be noted that the addition of 1 cc. of ethyl alcohol to 1 cc. of diluted kala azar serum (1/10 in physiological saline solution) at a temperature of 30°C. gives a marked turbidity, while normal serum similarly tested remains clear. In another direction flocculation by distilled water may be increased by reduction of pH, which in the reaction of Auricchio and Chieffi is brought about by the addition of peptonate of iron to the distilled water. The author has done a useful service in attempting to explain the various serological tests based on euglobulin increase and in giving his readers a rational account of what was

tending to become a somewhat confusing subject. It is clear that those who are interested in these serological reactions will have to read this paper in its entirety.

C. M. W.

KRISHNAN (K. V.), PAI (N. G.) & BOSE (P. N.). **Changes in Certain Chemical Constituents of the Blood in Kala-Azar.**—*Indian Med. Gaz.* 1936. Oct. Vol. 71. No. 10. pp. 574–576. [12 refs.]

A number of cases of kala azar in the Carmichael Hospital for Tropical Diseases, Calcutta, were investigated from the point of view of changes in the cholesterol, glucose and phosphorus content of the blood. Of these, cholesterol alone showed any abnormality, being low in advanced cases. A return to the normal level occurred with treatment and cure.

C. M. W.

KOPACZEWSKI (W.). Gélification des constituants sanguins. [**Gelification of Blood Constituents.**]—*C. R. Acad. Sci.* 1937. Feb. 8. Vol. 204. No. 6. pp. 453–456.

The authors have investigated the part played in gelification by the various blood constituents, plasma, serum, red blood corpuscles, which for purposes of the investigation have been separated from one another. All the three constituents mentioned will give gelification with suitable reagents but the most rapid is obtained with the laked red blood corpuscles. It is noteworthy that a concentration of red blood corpuscles similar to that of the normal blood is gelified by lactic acid in a strength only a little above that which occurs in normal blood. The laking of the red blood corpuscles if not brought about by their suspension in distilled water results immediately on the addition of the gelifying reagent.

C. M. W.

MARTILLOTTI (F.). La ricerca del parassita di Leishmann per mezzo di strisci dermici. [**Examination of Dermal Smears for Leishmania.**]—*Pediatria.* 1937. Mar. 1. Vol. 45. No. 3. pp. 213–215.

The author has investigated the possibilities of diagnosing infantile kala azar by the examination of smears made from the dermis but has reached the conclusion that this method, owing to the difficulty of interpreting the structures seen, cannot replace the search for parasites in spleen or bone marrow.

C. M. W.

MALAMOS (B.). Diagnostische Intrakutanreaktionen bei den Leishmaniosen. [**Diagnostic Skin Test for Leishmaniasis.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 240–243.

In an earlier paper on leishmaniasis in Canea (this *Bulletin*, 1937, Vol. 34, p. 40) certain experiments on skin reactions following intracutaneous injection of leishmania antigen in cases of kala azar and oriental sore were described. In the present paper a more detailed description of these is given and the results are discussed from the point of view of the possibility of a skin test as a diagnostic procedure. As previously noted, the reaction is a group one, but a *Leishmania donovani* antigen will give a positive reaction in cases of kala azar more frequently

than in cases of oriental sore and *vice versa*, provided the infections in both cases have been of sufficient standing. Early cases fail to give a reaction. C. M. W.

GIRAUD (Paul), MONTUS, SARDOU & GAUBERT. Le diagnostic du kala-azar par la ponction ganglionnaire. [**Gland Puncture for Diagnosis of Kala Azar.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1936. Nov. 23. 52nd Year. 3rd Ser. No. 31. pp. 1493-1496.]

The authors call attention to the practicability of gland puncture for the diagnosis of kala azar. Two cases in children are described in which this procedure was easily carried out on inguinal glands. COCHRAN (1912), writing of kala azar in China, suggested excision of glands for the diagnosis of the disease. C. M. W.

LORANDO (N.). La ponction sternale, méthode de choix pour la recherche des leishmanies. [**Sternal Puncture Best Method for Diagnosis of Kala Azar.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1937. Mar. 8. 53rd Year. 3rd Ser. No. 8. pp. 314-316.]

In the author's experience the operation of sternal puncture for the diagnosis of kala azar is a simpler procedure than spleen puncture. During the course of 1936 sternal puncture was performed by him in six cases in Athens, in all of which leishmania were found by examination of the bone marrow smears. C. M. W.

GIRAUD (Paul) & GAUBERT. Valeur de la ponction de la moelle osseuse pour le diagnostic du kala-azar méditerranéen (d'après les résultats de 22 ponctions du tibia). [**Puncture of the Tibia for Diagnosis of Kala Azar.**—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1937. Mar. 15. 53rd Year. 3rd Ser. No. 9. pp. 336-339.]

The authors find that puncture of the tibia in young children is a simple operation which can be carried out without any local anaesthetic. The point chosen is the outer face of the tibial epiphysis 1 cm. below the knee joint. A fine trochar and canula is passed in till entry into the spongy tissue is felt by the sudden loss of resistance. The trochar is removed and the canula is moved about to encourage entry into it of bone marrow. The canula is then closed with the finger and withdrawn, and films made from the contents. The procedure, though perhaps not so reliable for diagnostic purposes as spleen puncture, is so simple that it should always be tried before the more serious spleen puncture is attempted. C. M. W.

FAN (P. L.). **Use of a Pentavalent Antimony Compound for treating Kala-Azar in Children.**—*Amer. Jl. Dis. Children*. 1936. Oct. Vol. 52. No. 4. pp. 887-891. With 1 chart.

The paper describes the successful treatment of kala azar in a boy by neostibosan in N. China at the Cheeloo University children's clinic. Mention is made of 235 other patients who were treated with the same remedy and discharged from hospital. Replies to enquiries

were received from 127 of these one month to seven years following completion of treatment and from these it appeared that 96.9 per cent. had been cured. C. M. W.

VLACH (Giuseppe). La leishmaniosi canina in Trieste e Provincia. [**Canine Leishmaniasis in the Trieste Region.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Sept. Vol. 17. No. 9. pp. 513–541.

The examination of spleen smears from 115 dogs in Trieste or the surrounding district for evidence of leishmania infection has given an infection rate of about 1.8 per cent. C. M. W.

NICOLAU (S.) & PÉRARD (Ch.). Etude histo-physio-pathologique de l'oeil et du système nerveux dans la leishmaniose généralisée du chien. [**Histo-Physio-Pathological Study of the Eye and Nervous System in Generalized Canine Leishmania.**]—*Ann. Inst. Pasteur.* 1936. Nov. Vol. 57. No. 5. pp. 463–486. With 19 figs. [46 refs.]

The authors have made a detailed study of the eye and nervous system in cases of canine kala azar. Examination of eyes which have appeared quite normal has shown that leishmania infected macrophages occur in all parts of the eye except the lens and the retina. The presence of parasites in healthy eyes is compared with their occurrence in apparently normal skin, as has been described by a number of observers. In the nervous system generally infected cells have been found in the choroid plexus, which appears to prevent the passage of parasites into the substance of the brain. Sometimes parasitized cells were seen in the meninges. Like the brain, the substance of the spinal cord was free, though infected cells were seen in the nerve roots, posterior ganglia and in the peripheral nerves like the sciatic nerve. It is concluded that the presence of cells in the nervous tissues accounts for the various nervous symptoms which sometimes characterize cases of kala azar. The paper is well illustrated by drawings depicting the various findings. C. M. W.

DONATIEN (A.) & LESTOQUARD (F.). Le parasitisme du poumon dans la leishmaniose générale du chien. [**Parasitism of the Lung in Generalized Leishmaniasis of the Dog.**]—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 28–31.

The authors find from the post-mortem examination of ten dogs suffering from canine kala azar that leishmania infection of the lungs is of regular occurrence in this disease. The degree of infection, as judged by the number of parasites in smears, is very variable. These findings are compared with the frequent presence of *Rickettsia canis* in monocytes of the lung in infected animals. C. M. W.

GIRAUD (P.) & CABASSU (H.). Le diagnostic de la leishmaniose canine par la ponction ganglionnaire. [**Gland Puncture for Diagnosis of Canine Kala Azar.**]—*Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 958–962.

The authors advocate puncture of the lymphatic gland for the diagnosis of canine kala azar. When there are well developed skin

lesions the regional glands are much enlarged and the operation of puncture is simple. Though in other cases it is more difficult, it can nevertheless be carried out successfully.

C. M. W.

NAPIER (L. Everard) & HALDER (K. C.). **The Incubation Period of Oriental Sore.**—*Indian Med. Gaz.* 1936. Dec. Vol. 71. No. 12. pp. 723-724. With 1 fig.

The author records a case of oriental sore in a man in Calcutta in which the first signs appeared on the bridge of the nose more than three years after the man left his home in Rajputana, an epidemic area for the disease.

C. M. W.

GOODALL (J.). **Clinical Study of Sixty-Three Cases of Oriental Sore.**—*Indian Med. Gaz.* 1937. Jan. Vol. 72. No. 1. pp. 3-9. With 14 figs. (10 on 2 plates).

After the earthquake in Quetta on May 30, 1935, two companies of K.G.O. (Bengal) Sappers and Miners were sent to carry out relief work. Most of the men, about 550 in number, set out from Roorkee on June 1 and returned in November. During the stay in Quetta or after return to Roorkee approximately 11·8 per cent. developed oriental sore. The number of sores per man varied from 1 to 17, the commonest number being 3 to 8. Potassium antimony tartrate 1·5 grain administered intravenously twice a week was the average treatment, while locally the sores were covered with a simple saline dressing; sometimes local injections of emetin or orisol (berberine) were given. In one case neostibosan was administered. There was considerable variation in the time taken for the cases to heal. Some cleared up after the administration of two or three grains of tartar emetic combined with local treatment, others required more than eighteen grains. In chronic cases, the most difficult to cure, the local use of emetin hastened recovery as also did the local dressings if not neglected. Some cases in which the local dressings were kept clean had recovered in three to six weeks, while others in which the sores were allowed to become septic lasted as long as four months.

The editor (NAPIER) adds to the paper certain comments. It was possible to determine a longer incubation period than three months in 56 per cent. of the cases and one longer than four months in 19 per cent. Though it is known that the incubation period is frequently more than four months there has been a tendency to favour a period shorter than three months. The cases in this series do not favour a shorter period. Charts of the distribution of the sores show that they had the same distribution as in those prepared by ACTON (1919) and that they correspond with the sites chosen by sandflies for biting. Certain sores in which leishmania were not discovered had the same distribution and were thus undoubtedly oriental sores with scanty parasites. In cases with multiple sores these occupied the same sites as those with single or few sores, a fact which suggests that the multiple sores have the same aetiology as the single sore and do not result from spread of parasites by the blood or lymphatics. The cases appear to demonstrate that tartar emetic is the mainstay in treatment of this disease, a result of some importance in view of the low cost of this drug.

C. M. W.

TROW (Emerson J.). **Oriental Sore. Report of a Case.**—*Arch. Dermat. & Syph.* 1937. Mar. Vol. 35. No. 3. pp. 455-458. With 3 figs.

A record of a typical case of oriental sore with lesions on the nose and arm in a patient who had returned to Canada from India by way of Mesopotamia. C. M. W.

DOSTROVSKY (A.). **Relapses in Cutaneous Leishmaniasis.**—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 267-274. With 5 figs. on 1 plate.

Writing of cutaneous leishmaniasis in Palestine the author notes that usually there is a single lesion but that sometimes more than one occurs. The single lesion may heal entirely but occasionally nodules appear round the primary lesion or even round its scar after complete healing. As these nodules heal others may appear outside them. The regional lymphatic gland may become involved and nodules may develop along the course of the lymphatics connecting the region of the sore to the gland. Cases of the type described and illustrated in this paper are very chronic and may give histories of six years. In the chronic lesions it may be difficult to find leishmania. C. M. W.

BÉRYN (P.). **Floculation du sérum dans l'eau distillée et leishmaniose cutanée américaine.** [**Flocculation of Serum in Distilled Water with Relation to American Cutaneous Leishmaniasis.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 134-135.

In an earlier paper (this *Bulletin*, 1935, Vol. 32, p. 130) CHORINE, PRUDHOMME & KOEHLIN have described the flocculation which occurs when serum from patients suffering from various diseases is diluted ten-fold with distilled water. The degree of flocculation varies. Normal as well as syphilitic sera flocculate hardly at all; malarial serum flocculates well, while kala azar serum does so abundantly. By a photometric method the degree of flocculation can be given a numerical value. When this is in the region of 100 kala azar can be suspected.

In the present paper is given an account of tests carried out in ten cases of South American cutaneous leishmaniasis. Most of the sera gave very weak flocculation, the figures varying from 2 to 37. In two cases, however, figures of 80 and 105 were obtained. The precautionary remark is made that from time to time sera are encountered which give an abundant flocculation without there being any evidence of leishmania infection. C. M. W.

SAVON SALABERRY (Julio). **Leishmaniosis tegumentaria y mucosa americana.** (Estudio de algunos casos. Tratamiento.) [**Treatment of Cutaneous and Mucosal Leishmaniasis.**]—*Prensa Méd. Argentina.* 1936. Oct. 21. Vol. 23. No. 43. pp. 2427-2436. With 20 figs.

In this illustrated article the author calls attention to the frequency of cutaneous and mucosal leishmaniasis in the northern parts of the Argentine. Treatment by various preparations of antimony has given good results but the best have been obtained with foudadin, which has been used both intramuscularly and intravenously. C. M. W.

FLYE SAINTE MARIE (P.). Un nouveau cas de bouton d'orient observé dans le Nord Marocain. Traitement par l'antimoniothiomalate de lithium (anthiomaline) en injections locales; guérison rapide. [A Case of Oriental Sore in N. Morocco. Rapid Cure by Local Injections of Anthiomaline.]—*Bull. Soc. Path. Exot.* 1936. Oct. 14. Vol. 29. No. 8. pp. 881–885. With 3 figs. [17 refs.]

The case concerned a child, 12 years of age, with a large fungating oriental sore of about a year's standing on the left cheek. A cure was obtained in the remarkably short time of two weeks by a series of local injections of the preparation referred to in the title, the contents of a 1 cc. ampoule being diluted with 5 cc. of distilled water. The sore was covered with a dressing charged with 12 cgm. of the compound.

C. M. W.

LAWROW (A. P.) & DUBOWSKOJ (P. A.). Ueber Schutzimpfungen gegen Hautleishmaniose. [Inoculation against Oriental Sore.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Apr. Vol. 41. No. 4. pp. 374–379.

In localities where oriental sore is common the only method of protection is the prevention of the disease in undesired positions on the body by direct inoculation at a chosen site. In some cases it is possible to inoculate from one person to another on the arm or leg but this cannot be done on a large scale. The authors, working in S.E. Russia, have been experimenting with cultures of leishmania which it is possible to maintain without difficulty in the clinics. During the past few years about 500 persons have been inoculated intracutaneously with 0.1 to 0.2 cc. of culture. In 73 per cent. of the cases a sore developed at the site of inoculation after an incubation period of 2–6 months. The lesion increased in size for 2 or 3 months and then gradually healed in 6 to 12 months. The immunity which has then been acquired will prevent any further infection and the scars on exposed parts of the body, which in some cases are very disfiguring.

C. M. W.

MALARIA.

WILSON (D. Bagster) & WILSON (Margaret E.). **The Manifestations and Measurement of Immunity to Malaria in Different Races.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 431-448. With 5 figs. [25 refs.]

This discussion, based on the findings of the authors and other workers, of spleen and parasite rates in Indians, Malays, Bantu and Masai, is chiefly concerned with the light such data throw on the question of immunity. The authors were at pains to ascertain whether differences in such endemic data represent racial distinctions in the human reaction to malaria. They conclude that such differences may be explained in terms of immunity and hypersensitivity and that the immune status is not dependent upon race but upon frequency of infection. Frequency of infection in the non-immune, that is in early life, is the most accurate index of endemicity. Variation with age in the spleen and parasite rates is of greater significance than the spleen rate and the endemic index in assessing endemicity and immunity and its study may enable a rough classification of communities into immune and sub-immune. The suggestion is made that the average parasite count, and its variation with age, are the most sensitive index available for field studies. *Norman White.*

MELONEY (Henry E.). **The Problem of Malaria Mortality in the United States.**—*Amer. Jl. Trop. Med.* 1937. Jan. Vol. 17. No. 1. pp. 15-24.

This presidential address to the American Society of Tropical Medicine directs attention to the continued importance of malaria as a cause of mortality in thirteen southern States. In 1934 there were 3,900 deaths ascribed to malaria in these States, a figure but little short of that of the mortality from typhoid fever and diphtheria combined. The author considers that a significant reduction in this malaria mortality might be, and should be, effected. To this end he urges the creation in all States of a rapid diagnostic service for malaria; the instruction of all physicians more especially with regard to the value and limitations of the newer synthetic drugs and the necessity of intravenous medication for critically ill patients; popular education stressing, among other things, the inadequacy of self-treatment; and a limitation of the sales of chill tonics. The recommendation is also made that State Health Departments should investigate all deaths ascribed to malaria as well as deaths from acute diseases in which the diagnosis is doubtful. Finally, attention is drawn to the importance of all medical schools providing adequate instruction in the clinical and laboratory diagnosis of malaria and its treatment. *N. W.*

WORTH (H. N.). **The Control of Anopheline Breeding in River Beds.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 521-530. With 12 figs. on 4 plates.

In Ceylon *A. culicifacies*, the chief if not the only vector of malaria, frequently breeds in the pools and shallows of river beds, particularly in the wide sand-bottomed rivers. This interesting paper describes an engineer's attempts at eliminating such breeding, by the control of

low water channels. The work was carried out in the Badulla Oya River, which is about 150 feet wide; most of it has a sandy bed but in the upper reaches boulder and rock formations occur. The rocky section was treated by draining, filling and sealing. For the sandy portion use was made of a dry-weather channel control method that has been long used in Burma to facilitate the rafting of logs from the teak forests, modified to suit local conditions. The method comprises the construction of low parallel bamboo stake fences along both sides of the dry weather channel. These are designed to cause the deposition of suspended silt, thus causing an increase in the height of the side banks. Spur dykes, of similar construction, were placed at intervals of 50 to 75 feet between the banks and the channel fence. As the fall of the river bed is considerable, up to 1 in 600, a number of check dams were constructed across the river from bank to bank to prevent scouring of the channel itself. These check dams were formed of three rows of bamboo stakes, four feet apart, and the enclosures between were packed with loose boulders. The results of the experiments have shown that pools and shallows in river beds, which formed the main breeding places of *A. culicifacies* during the recent epidemic, can be enormously reduced and, in certain situations, entirely eradicated by the adoption of suitable engineering devices. As a preliminary measure it is important to remove all temporary obstructions to the flow of the river, such as trees, logs and debris. The photographs illustrating this paper are excellent.

N. W.

PAMPANA (E. J.). Malaria in Italy and "Bonifications."—*Malayan Med. Jl.* 1937. Mar. Vol. 12. No. 1. pp. 1-8. With 2 charts.

STRICKLAND (C.). **Papers on Malaria in Malaya.**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1936. Vol. 25. No. 3. pp. 331-340. With 4 plates.

The observations recorded in this paper were made when the author was Malariologist to the Government of the F.M.S. They were made some twenty years ago. An interesting account is given of the mangrove forests of Malaya, their formation, flora and fauna. No anophelines were discovered in the different mangrove zones of the coast, nor was there evidence of malaria incidence among people living in close relation to mangrove. Mangrove from the point of view of malaria is, therefore, harmless.

N. W.

EJERCITO (A.). MENDIOLA (J. C.) & BAIASAS (F. E.). **Can Malaria be contracted in Manila?**—*Rev. Filip. Med. Farm.* Manila. 1936. June. Vol. 27. No. 6. pp. 243-262. With 1 fig. [Summarized in *Rev. Applied Entom.* Ser. B. 1937. Feb. Vol. 25. Pt. 2. pp. 29-30]

"In an attempt to establish whether malaria can be contracted in Manila, the authors made investigations in 1933-35 on reported cases, the prevalence of malaria in the area of the city most concerned, and its Anopheline population. Of 81 cases confirmed from 1st March 1933 to 31st October 1935, all had probably contracted the disease in the provinces. They included 3 cases, however, that appeared to incriminate the Santa Ana district of Manila, and a survey of the inhabitants of 80 per cent. of the houses in it was therefore made.

Of 62 children under the age of ten, two showed splenomegaly and none a positive blood test, while of 192 persons over ten, one showed a positive blood test and none splenomegaly. Similar tests in the local elementary school, in which 214 persons were examined, gave negative results.

"Observations made from 18th August to 15th November 1935 on Anophelines in this district of Manila, a circle with a radius of nearly a mile, showed that at first very little breeding took place, owing to floods and heavy rains, but gradually more breeding was observed, the amount falling again at the end of October, owing to the drying up of pools, etc. Of 631 Anopheline larvae collected and identified, 346 (55 per cent.) were *Anopheles hyrcanus* var. *nigerrimus*, Giles, and 227 (36 per cent.) *A. vagus* var. *limosus*, King. The others were *A. annularis*, Wulp (11), *A. barbirostris*, Wulp (2), *A. hyrcanus* var. *sinensis*, Wied. (13), *A. philippinensis*, Ludl. (22), *A. subpictus* var. *indefinitus*, Ludl. (9), and *A. tessellatus*, Theo. (1). Dissections were made of 983 adult females belonging to all these species, 189 of these being *A. hyrcanus* var. *nigerrimus*, 191 *A. subpictus* var. *indefinitus*, and 512 *A. vagus* var. *limosus*, and the results are tabulated. None was infected. No examples of *A. maculatus*, Theo., or *A. minimus* var. *flavirostris*, Ludl., the vectors of malaria in the Philippines, were found, although suitable breeding places exist, no Anophelines were caught inside houses and very few outside in their vicinity, and most of them were caught near buffalos, cows and pigs.

"In accordance with this evidence, it is concluded that malaria is not contracted in Manila."

WONG (Helena), KANG (T.) & JARVIS (B. W.). **Some Notes on Malaria in Foochow. A Review of 107 Cases in 1935.**—*Chinese Med. J.* 1937. Mar. Vol. 51. No. 3. pp. 385-390. With 1 fig. [10 refs.]

Malaria has increased in Foochow during recent years: the increase is attributed to the influx of refugees from north-west Fukien and to the return of soldiers from Central China. A clinical description is given of 107 cases treated as inpatients in hospital. Fifty-nine of these were subtertian infections. The disease was most prevalent in November. Rainfall is plentiful from April to August, being most plentiful in June.

N. W.

DRBOHLAV (J.). Sur l'épidémiologie du paludisme dans la Russie Subcarpathique de 1923 à 1936. [**Epidemiology of Malaria in Subcarpathian Russia from 1923 to 1936.**]—*Travaux Inst. d'Hyg. Pub. Etat. Tchécoslov.* 1936. Vol. 7. No. 4. pp. 158-172. With 24 figs. on 14 plates.

Subcarpathian Russia is the easternmost of the four administrative divisions of Czechoslovakia. It lies to the south of the Carpathian chain of mountains between 22°15' and 24°34' E. Poland borders it on the north, Hungary and Rumania on the south. The north and north-east parts of the territory are covered with forest.

For a long time past malaria has been known to exist in Subcarpathian Russia but cases were few and mild. In 1927 and 1928, however, there was a considerable extension of the disease from the south-west corner of the territory to the central and north-west parts. In 1928

some 850 cases were notified. During the following years the conditions improved but in 1933 and 1934 a still higher rise in the morbidity curve was noted: in the latter year nearly 4,000 cases were notified. The disease remains abnormally prevalent. Nearly all cases were formerly believed to be *vivax* infections: in 1936 a certain number of *falciparum* infections were observed.

Gipsy hamlets with their primitive insanitary conditions play a rôle of importance in spreading infection. Their houses are built of sun-dried bricks, the clay for this purpose being excavated close to the site of the dwelling. The borrow-pits thus formed are important breeding places for anophelines. *A. maculipennis* is the predominant species. *A. elutus* and *A. bifurcatus* also occur. N. W.

DE VERTEUIL (Eric J.) & SPENCE (T.). **Malaria in Trinidad. Low Tide Level Culvert System in Coastal Drainage.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Jan. 26. Vol. 30. No. 4. pp. 449-460. With 1 text fig. & 7 figs. on 2 plates.

Long before there was any precise knowledge of the factors responsible for the prevalence of malaria in Trinidad the disease diminished in intensity. The social and industrial development of the larger towns on the coast was accompanied by a decrease in the extent of brackish swamps in their vicinity. Intensive agricultural activity, cocoa and sugar-cane, added much to the prosperity of the island. Between 1910 and 1930 much valuable drainage work was done near populated areas. Extended use of quinine, improved housing and living conditions, much improved nutrition, the example given by the oil industry in the southern portion of the island in screening houses and in other matters pertaining to the welfare of the workers, all contributed to the diminished prevalence of malaria.

In 1930 a malaria survey of the island was carried out. The only two vectors of importance are *A. tarsimaculatus* and *A. cruzi* (*bellator*). The latter species breeds in collections of water at the base of leaves of bromeliads, parasitic plants which grow on trunk and branches of forest trees. When confined to the forest the species did but little harm. Unfortunately "immortelle" trees, which have been extensively planted as shade trees on cocoa estates, have become heavily parasitized by bromeliads and *A. cruzi* is now reputed to be responsible for 20 per cent. of the malaria mortality.

A. tarsimaculatus is a brackish water-breeding mosquito dependent upon the existence of coastal swamps and river mouths. This paper describes a method employed to eliminate such swamps by the construction of low-tide level culverts from the deepest part of the swamp through the sand bank. These culverts are constructed of concrete and are either open or of the box type, and provided with one or more sluice gates, according to circumstances. The reclaimed land has definite agricultural value. In many cases permanent elimination of *Anopheles* breeding has been obtained at small cost. N. W.

GERMAIN (A.) & MORVAN (A.). **Paludisme à incubation prolongée. [Prolonged Incubation Period in Malaria.]**—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 26-28.

The patient had done two years' service in French Indo-China during which time he was never ill. He had taken regularly 0.40 gm.

of quinine a day, increased to 1 gm. a day when on duty in the interior of the country. He left Indo-China at the end of May and went to live in a part of France where there is no indigenous malaria. On the 10th of November following he fell ill with an acute attack of malaria, *Pl. vivax*. Infection had thus remained latent for at least five and a-half months and from spring to autumn. N. W.

MORENAS (L.) & BRUN (J.). Un nouveau cas de paludisme à incubation prolongée. [**Another Case of Malaria with Prolonged Incubation Period.**]*—Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 957-958.

A man aged 23 completed his military service in Algeria in August 1935 and returned to France; he had never been ill during his service. Nine months later, towards the end of May 1936, he fell ill with malaria. There does not appear to have been any possibility of his having acquired the infection in France. N. W.

FABRY (A.), GUILLERM (J.) & RAGIOT (Ch.). Syndrome lipoidique et parapaludisme. [**Fatty Nephrosis as a Sequel to Malaria.**]*—Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 90-98.

The syndrome, first described by MUNK in 1913 under the name of fatty nephrosis, is frequently observed in Cochinchina. Ten such cases are described, all in young men. It is a chronic condition with extensive oedema. The urine is scanty and highly coloured and there is massive albuminuria. There is an increase of cholesterol in the blood, a diminution of the total serum proteins and a lowering, or even inversion, of the albuminous serine globulin ratio. Urea is normal if there is no associated nephritis. All were old chronic malaria cases. Malaria treatment was of little or no avail. The authors express the view that the condition is a paramalarial one. N. W.

MALLARDO (C. Amatuucci) & COTRUFO (P.). I mezzi di riattivazione della malaria latente. [**Reactivation of Latent Malaria.**]*—Riforma Med.* 1936. Dec. 5. Vol. 52. No. 49. pp. 1651-1655. [31 refs.]

The authors have shown that the subcutaneous injection of tuberculin (Koch's bovine tuberculin in carbolyzed $\frac{1}{2}$ per cent. normal salt solution) compares very favourably with the more usual methods employed to reactivate latent malaria infections, with the reappearance of gametes and schizonts in the peripheral blood. In two out of 20 successful cases a quarter of a milligram of tuberculin was sufficient; in 16 cases half a milligram was required, in two cases one milligram.

N. W.

BONNIN (H.) & BORNEUF (R.). Les formes pseudo-péritonéales du paludisme. [**Pseudo-Peritoneal Forms of Malaria.**]*—Reprinted from Gaz. Méd. de France.* 1936. Vol. 43. No. 14. 18 pp.

This is an admirable clinical account of those forms of malaria in which abdominal symptoms give rise to suspicions of peritonitis. Such cases may present considerable difficulties in diagnosis, and are

classified by the authors as follows :—(1) Cases in which general signs of peritonitis dominate the scene. (2) Cases in which there are no precise signs of localization. (3) Cases in which pain, tenderness and rigidity are localized from the beginning, simulating, according to such localization, cases of appendicitis, gastroduodenal cases, or liver or gall bladder involvement.

The onset of such cases is generally sudden ; they occur only in places in which malaria is endemic and are generally the result of a primary infection or a recent heavy reinfection, most commonly with *Pl. falciparum*. Symptoms often suggest perforation of stomach, intestine or appendix. The pulse, however, though it may be extremely rapid, is fuller and stronger than it is in cases of general peritonitis arising from such causes. Superficial examination of the abdomen appears to cause more pain than deep palpation ; this is a characteristic sign. An examination of the blood generally reveals a heavy infection. Specific treatment is then of course indicated. It must not be forgotten, however, that an acute attack of appendicitis, for example, may complicate an attack of malaria.

This paper should be of interest to surgeon and physician alike, practising in countries where malaria is endemic. N. W.

MARIANI (Giacomo) & TADDIA (Leo). Considerazioni cliniche e morfologiche su alcuni casi di malaria osservati in Somalia. [**Atypical Cases of Malaria observed in Somaliland.**—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Oct. Vol. 17. No. 10. pp. 621-627. With 15 figs.]

A description of three cases of malaria with atypical symptoms observed in Somaliland. The parasites found in these three cases resemble the descriptions of *Pl. ovale*. The authors consider them to be quartan infections and ascribe the atypical morphological forms of the parasite to the influence of climate and of prophylactic quinine.

N. W.

ROMANENKO (A. P.). [**Two Cases of Comatose Form of Tertian Malaria treated by Subcutaneous Injections of Quinine and Methylene Blue.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 6. pp. 925-926. [In Russian.]

Description of two cases of benign tertian infection in the comatose stage treated successfully by injections of 3 and 1 cc. of 20 per cent. solution of camphor, 4 and 3 cc. of 25 per cent. solution of quinine hydrochloride, and 10 and 6 cc. of 2 per cent. solution of methylene blue. In both instances the patients gained consciousness in a few hours, and recovered completely after 4 and 5 days' courses respectively of intramuscular injections of 10 per cent. solution of quinine hydrochloride.

C. A. Hoare.

MORENAS (L.) & BRUN (J.). Accès pernicieux de paludisme observé à Lyon chez un sujet ayant quitté l'Algérie depuis un mois. [**Fatal Case of Malaria.**—*Bull. Soc. Path. Exot.* 1936. Nov. 18. Vol. 29. No. 9. pp. 953-957. With 2 figs.]

A clinical and pathological description of a fatal case of cerebral malaria in a hospital in Lyons. N. W.

MONTEL (R.) & TRUONG VAN QUÈ. *Infantilisme palustre. [Malarial Infantilism.]—Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1074–1082. With 4 figs.

A short clinical description of seven cases of typical infantilism, illustrated with photographs, all of which are attributed to severe and repeated malaria infections. They were all cases of arrested development affecting growth and the sexual organs. Five were males, two females. One was aged 14; the ages of the others were between 17 and 24. Such cases, the author asserts, are amenable to appropriate anti-malaria treatment, growth and development subsequently proceeding in a normal manner, though so much delayed. N. W.

SHUSHAN (Morris), BLITZ (Oscar) & ADAMS (C. C.). *The Role of Reticulocytes in Malaria. Studies on Benign and Subtertian Malaria.—Jl. Lab. & Clin. Med.* 1937. Jan. Vol. 22. No. 4. pp. 364–370. [10 refs.]

Erythrocytes, reticulocytes and parasites were enumerated in seven cases of *vivax* and in thirteen cases of *falciparum* infection. Ninety-five preparations were examined. Excluding cases of severe anaemia, reticulocyte counts were normal or subnormal during the febrile period: irregular fluctuations in the counts were noted. Reticulocytes are selectively prone to infection by *vivax*; in *falciparum* infections reticulocytes and mature erythrocytes are equally liable to become infected. The authors consider that this may account for the higher parasite counts observed in subtertian malaria. They also consider that Schüffner's granules may be related to the basophilic stippling of reticulocytes. N. W.

KOTIKAS (Alexander). *Beiträge zur Klinik und Therapie der kindlichen Malaria.—Deut. Med. Woch.* 1936. Dec. 4. Vol. 62. No. 49. pp. 2001–2003.

MANSON-BAHR (P.) & MUGGLETON (W. J.). *Plasmodium ovale Infection contracted in Different Parts of West and Central Africa.—Brit. Med. Jl.* 1937. Jan. 30. pp. 217–218.

A clinical description of four cases of *Plasmodium ovale* infection acquired, respectively, in Uganda, Nigeria, Belgian Congo and Sierra Leone. From the clinical point of view the cases were mild: rigors and fever recurred almost invariably during the course of the evening. Abdominal pain referred to the appendix region led to a diagnosis of appendicitis in three of the four cases. Rheumatic pain in various parts of the body, especially the lumbar region, was characteristic. *Pl. ovale* infections are very amenable to quinine or atebirin treatment. N. W.

MÜHLENS (P.). *Quartana-Rückfälle nach langer Latenz. [Relapsing Quartan Malaria Cases after Long Latency.]—Muench. Med. Woch.* 1937. Jan. 1. Vol. 84. No. 1. pp. 5–7. [13 refs.]

The author refers to his paper on relapse cases in war malaria [this *Bulletin*, 1937, Vol. 34, p. 369]. In the present paper he deals with four cases, including one described in a postscript, which he had met

with in the last two years. These cases had been definitely shown by microscopic investigation to be infections with *Plasmodium malariae*. Three occurred in elderly persons who had attacks of fever of the quartan type for a long period, but they were not recognized previously as malarial. Several decades before they had lived in quartan malarial areas. It was highly probable, although not capable of certain proof, that the febrile relapses occurring throughout the previous years were due to quartan infections. The fourth case was a person who had contracted quartan malaria in Macedonia during the war in 1917. He gave a history of febrile attacks with rigors in 1921, 1923 and since the beginning of October 1936. His spleen was enlarged. Specimens of his blood were sent recently to the author, who demonstrated the presence of *Plasmodium malariae* in them, so this person was suffering from a relapse due to a quartan infection contracted 19 years previously. The author stresses the importance of complete study of all attacks of fever resembling quartan malaria infections, particularly amongst persons who had served in the war.

E. D. W. Greig.

RODRÍGUEZ MOLINA (Rafael) & OLIVER GONZÁLEZ (José). **Hematological Studies on Malaria in Puerto Rico. Report of 100 Cases.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1936. Dec. Vol. 12. No. 2. pp. 267–280. With 7 figs. [Spanish version pp. 281–294.]

A record of the results of blood examination of 83 chronic and 17 acute cases of malaria. The mean red cell count was 3.95 millions and the mean haemoglobin 85 per cent. This relatively slight degree of anaemia is attributed to racial or acquired resistance to malaria and a high protein content of the diet. A macrocytic anaemia was found in 34 cases, normocytic in 37, simple microcytic in 16 and hypochromic in 13 cases. Characteristic leukopenia was seen in 35 cases. Schilling haemograms showed a degenerative shift in the granular leucocytes.

N. W.

MIYAHARA (Hatu) & OGURA (Masatake). **Clinical Studies on Malaria. VI. Studies on Malaria-Parasite-Staining. (1). On a New and Rapid Method of staining the Parasite with Giemsa's Stain.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa).* 1936. Dec. Vol. 35. No. 12 (381). [In Japanese pp. 2806–2815. With 6 figs. on 1 plate. [37 refs.] English summary p. 2816.]

The authors suggest a slight modification of staining with Giemsa solution and report good results. They make a thin film of blood and after allowing it to dry thoroughly in the air, haemolyse the corpuscles by pouring water on the slide and allow the stain, made up by adding one drop of the Giemsa to 1 cc. of sodium or potassium carbonate of a strength of 0.003–0.005 per cent. heated to 60°C., to act for 5–10 minutes. The parasites stain clearly, showing well Schüffner's dots and Maurer spots. Ziemann's dots in quartan parasites are easily recognized though they are less defined than the Schüffner. Unparasitized cells are tinted a light pink well contrasted with those containing the parasites.

H. H. S.

HINGST (Hans E.). **Recent Observations on the Origin of Schüffner's Granules.**—*Amer. Jl. Trop. Med.* 1936. Nov. Vol. 16. No. 6. pp. 679-684.

The observations recorded in this paper were made during an attempt to confirm EATON's work on the susceptibility of red cells to malaria (see this *Bulletin*, 1935, Vol. 32, p. 423). The panoptic method of staining adopted consisted in the preliminary treatment of a clean glass slide with a saturated solution of brilliant cresyl blue in absolute alcohol. Upon this slide a thin film of blood was fixed with methyl alcohol for three minutes and then stained with Giemsa, one part in fifteen of distilled water, for thirty minutes.

Observations made on 953 parasitized red cells in 4,000 fields revealed all stages between basically stained reticular granules and eosinophilic Schüffner's granules. The author concludes that Schüffner's granules are of reticular origin. He agrees that failure to demonstrate Schüffner's granules may be due to defective staining but their presence is not constant. Specimens from two patients whose blood harboured *Pl. vivax* were examined daily for twenty days, one hundred fields of the blood film of each patient, or 4,000 fields in all. In these 4,000 fields 953 parasitized red cells were found: of these only 159 showed Schüffner's granules. In one case 36.4 per cent. of the parasitized cells showed the granules, in the other case 13.2 per cent. N. W.

BOYD (Mark F.), KITCHEN (S. F.) & MUENCH (Hugo). **On the Localization of the Geographical Distribution of the McCoy Strain of *Plasmodium vivax*.**—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 583-587.

The authors have previously shown that patients undergoing malaria therapy exhibited varying degrees of susceptibility to the strains used according to the patients' place of origin. The McCoy strain of *P. vivax* had its origin in West Florida in 1931. Since then the strain has passed through 25 consecutive human-anopheline passages and has been used for 178 inoculations of white hospital patients. Of these 155 were successful in transferring infection. The reaction of the patient to inoculation with this strain has been further studied in relation to the place of origin of the patient. Only one patient was completely refractory to infection: he came from West Florida where the strain originated. Two other patients from Florida and one European were successfully inoculated but had no clinical attack. Nearly all other patients from the southern States were successfully inoculated and developed clinical attacks, the duration of which, however, never exceeded twenty days. Most of the patients from the northern States and from Europe had clinical attacks of thirty or more days duration. N. W.

BOYD (Mark F.), KITCHEN (S. F.) & MUENCH (Hugo). **Seasonal Variations in the Characteristics of Vivax Malaria.**—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 589-592.

This study is based on the records of 155 patients therapeutically inoculated by Anophelines infected with *P. vivax* (McCoy strain). The observations extend over four and a-half years; the inoculations were given in the course of twenty-five consecutive human-anopheline

passages of this strain. Inoculations during the first three months of the year result in a lower proportion of "takes" than in the remaining three quarters of the year, 56.5 per cent. as compared with 92.9, 93.5 and 89.5 respectively. Successful inoculations during the first quarter have somewhat longer incubation periods, shorter clinical courses and, if renewed clinical activity follow the first febrile attack, such renewal is likely to be confined to a period of eight weeks following the cessation of that attack. The contrast in all these respects is greatest in the case of inoculations made during the third quarter of the year.

The wide degree of scatter in the frequency of the observations deprives the results of the inquiry of a high degree of statistical significance, but the trends of divergencies are consistent and of considerable interest.

N. W.

BEACH (Ted de Vinne). **Evidence of Binary Fission of Ring Forms in *Plasmodium vivax*** Grassl and Feletti.—*Amer. Jl. Trop. Med.* 1936. Mar. Vol. 16. No. 2. pp. 147–152. With 12 figs. on 2 plates.

The evidence brought forward is the usual one, namely the presence of two or more rings in a single red blood corpuscle and the occurrence of rings with two chromatin dots which appear to have been formed by division of the single dot. It is noted that at one time these appearances were interpreted as conjugating forms. This view was largely given up and is now being replaced by the view that these forms represent binary fission. The article is accompanied by a number of microphotographs purporting to illustrate the various stages in division of the chromatin and the subsequent division of the cytoplasm of the ring to form two daughter rings. C. M. Wenyon.

THOMSON (J. G.) & ROBERTSON (Andrew). **The Structure and Development of *Plasmodium falciparum* Gametocytes in the Internal Organs and Peripheral Circulation.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1935. June 29. Vol. 29. No. 1. pp. 31–40. With 34 coloured figs. on 1 plate. [15 refs.]

From a study of blood films from cases of *Plasmodium falciparum* infections from various parts of the world the authors have been able to follow the development of the crescent from small solidly built parasites, through elongate spindle-shaped forms to the typical mature crescent. The various forms seen are illustrated in an excellent coloured plate.

C. M. W.

MARCHOUX (E.) & JOLLY (A. M. D.). Cycle évolutif complet de *P. falciparum* dans le sang circulant. [**Complete Life Cycle of *P. falciparum* in the Peripheral Blood.**]—*Ann. Inst. Pasteur.* 1935. Dec. Vol. 55. No. 6. pp. 623–631. With 47 coloured figs. on 1 double plate. [18 refs.]

The authors call attention to the fact that occasionally in *Plasmodium falciparum* infections all stages of the development of the parasite may be found in the blood. One such case and the forms of parasite seen are described in some detail. Unless this fact is realized the appearances may be attributed to mixed infections. C. M. W.

CHAOULITCH (S.). La multiplication du *Plasmodium falciparum* (Welch, 1897) par scission binaire. [**Multiplication of *P. falciparum* by Binary Fission.**]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 716-722. With 1 fig. [11 refs.]

The author refers to the well-known fact that in malarial infections due to *P. falciparum* rings are commonly seen with two chromatin dots. By a series of drawings the author proves to his own satisfaction that division of the single chromatin dot and finally of the entire parasite takes place. The conclusion is that binary fission is the cause of the rapid increase in the number of parasites in malignant tertian malaria.

C. M. W.

MARIANI (G.) & BESTA (B.). Difficoltà che si incontrano nella diagnosi differenziale dei parassiti malarici nei preparati colorati.—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1936. Sept. Vol. 17. No. 9. pp. 567-571. With 29 coloured figs. on 1 plate.

JAMES (S. P.) & TATE (P.). **New Knowledge of the Life-Cycle of Malaria Parasites.** [Correspondence.]—*Nature.* 1937. Mar. 27. Vol. 139. No. 3517. p. 545. With 1 fig.

This is the first published reference to observations made by the authors in connexion with the life-cycle of *Plasmodium gallinaceum* (Brumpt). They have discovered that in addition to a schizogonic cycle of development in the circulating red blood cells of the domestic fowl and a sporogonic cycle in *Aedes aegypti*, *Plasmodium gallinaceum* has also a schizogonic cycle of development in reticulo-endothelial cells of the spleen, liver, kidneys and other internal organs and, in certain cases, in the reticulo-endothelial cells which line the capillaries of the brain of the vertebrate host. The discovery is of great interest and importance. Should a similar cycle of development occur in human malaria several unsolved problems might be elucidated.

In view of these observations the authors point out that it is no longer correct to define the Plasmodiidae as a family in which the whole of the vertebrate cycle of development occurs in red blood cells: the schizogonic cycle in endothelial cells resembles in some respects that ordinarily described as being characteristic of the Haemoproteidae.

N. W.

LANCET. 1937. Mar. 27. p. 764.—**New Light on the Life-Cycle of the Malaria Parasite.**

This editorial comments on the significance of the observations of JAMES and TATE on the schizogonic cycle of development of *Plasmodium gallinaceum* in the reticulo-endothelial cells of the internal organs of the fowl (see above).

N. W.

CHORINE (V.). Les réactions sérologiques dues aux euglobulines. [**Serological Reactions Attributable to Euglobulins.**]—*Ann. Inst. Pasteur.* 1937. Jan. Vol. 58. No. 1. pp. 78-124. With 2 figs. [102 refs.] [**Henry's Reaction** pp. 78-100.]

This is an admirable comprehensive study of the mechanism of Henry's reaction, Verne's resorcin reaction and the various serological reactions that have been used in the diagnosis of kala-azar.

With regard to Henry's reaction many of the author's conclusions have been published previously and have been noted in this *Bulletin* from time to time (see this *Bulletin*, 1934, Vol. 31, p. 180; 1935, Vol. 32, pp. 420, 422); they may be summarized as follows. Henry's reaction is not due to the presence of antibodies in the blood. Melanin has only antigenic properties for animals normally deprived of this pigment. Melanoflocculation is apparent three to seven days after infection; antibodies take much longer to develop. The reaction is only produced in distilled water or hypotonic solutions; antibodies act in isotonic or even in feebly hypertonic solutions. The flocculation in distilled water runs parallel with melanoflocculation; melanin acts merely as an indicator and as such can be replaced by other substances such as carmine. The chemical mechanism of the reaction is complex. The reaction is attributable to an increase in the serum of euglobulins and lipid substances which are precipitated by distilled water. Heating to 55°C. for half an hour abolishes the reaction: this is explained by the fact that CO₂ is driven off, the serum becoming alkaline. From the clinical point of view it is immaterial whether the flocculation of the serum is measured in a dilution of one in ten distilled water or of one in five with the addition of an indicator. The clinical value of the reaction is incontestable.

N. W.

SPANEDDA (Antonio). Semplificazione della melano-flocculazione di Henry con l'impiego di sangue laccato. [**Simplification of Henry's Reaction by Use of Laked Blood.**]*—Giorn. di Batteriol. e Immunol.* 1936. Oct. Vol. 17. No. 4. pp. 467-474. English summary (6 lines).

With the object of so simplifying the technique of Henry's reaction as to make its use possible for medical practitioners without laboratory facilities of any kind, the author suggests the substitution of laked blood for serum. Two or three drops of blood are mixed with 1 cc. of distilled water. A study of 122 cases has shown that the results obtained with laked blood are strictly comparable with the results obtained with serum.

N. W.

SZAUTER (B). Neues Verfahren (Dichtungsverfahren) zur Diagnose der tropischen Malaria. [**A New Concentration Method for the Diagnosis of Subtertian Malaria.**]*—Zent. f. Bakt.* I. Abt. Orig. 1937. Feb. 16. Vol. 138. No. 5/6. pp. 303-306. With 1 fig.

With a view to obviating certain disadvantages of the ordinary "thick drop" preparation the author worked out a new method. The method is as follows:—10 cc. of double distilled water are placed in a centrifuge tube; add to it 5 drops of concentrated acetic acid and 5 drops of blood from the patient; shake the tube till fluid is quite transparent; centrifuge for 10 minutes; take up the sediment in the centrifuge tube with a platinum loop and spread on a slide; dry over a flame; fix with methyl alcohol and stain with Giemsa. To ascertain the amount of concentration the number of white cells of the blood per field is determined: taking the value of an ordinary thin film from the patient as 1, then the ordinary "thick drop" preparation would give a 6-10-fold concentration, but the new method gives a 60-fold concentration. The method has the further advantage

over the "thick drop" preparation that the elements are lying in one plane and are therefore easier to recognize, this applies not only to malaria parasites but also to pathogenic bacteria which may be present in the blood. He considers that the method is particularly useful for the diagnosis of cases of subtertian malaria, because it enables the characteristic crescents to be detected even when very scanty in the peripheral blood.

E. D. W. Greig.

VAUCEL (M.) & HOANG-TICH-TRY. Réactions de malaria-flocculation au Tonkin. [**Malaria Flocculation Tests in Tonking.**—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Oct. Vol. 14. No. 8. pp. 1101-1114.]

This study, based on the results of 1,617 reactions carried out with 539 serums, indicates that flocculation tests, as an aid to the diagnosis of malaria, have but a limited value in tropical countries where there are commonly numerous causes of serum instability.

N. W.

DECOURT (Philippe). Les bases d'une thérapeutique curative du paludisme. [**Principles of Treatment of Malaria.**—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 5. pp. 358-369.]

The author has previously shown that quinacrine (atebrin), though pre-eminently a schizonticide, is not without some action on crescents [see this *Bulletin*, 1934, Vol. 31, p. 693]. After a preliminary course of quinine, quinacrine acts as a gametocyticide. Praequine (plasmoquine), though having a specific action on the sexual forms of the parasite, has also an action on schizonts which is of great importance. Its toxicity does not allow of its use in doses sufficient for it to act as a schizonticide, but in much smaller doses it is capable of interrupting the schizogonic cycle of development without destroying the schizonts. Thus is explained the power of this drug to diminish the number of relapses. The antischizogonic dose of praequine is approximately the same as its gametocyticide dose.

In certain circumstances quinacrine, without destroying the parasites, is capable of arresting the asexual reproduction of schizonts and their transformation into gametocytes. The dose necessary to bring about this refractory condition of the host with regard to the parasite varies in different conditions. Once established it lasts about three weeks, when a minimum additional dose is capable of prolonging it for a like period.

The antischizogonic action of quinacrine acts chiefly on the parasites in the circulation while that of praequine appears to act chiefly on the parasites fixed in the viscera.

The indications for treatment in primary attacks of malaria are very different from those in relapses. The parasite in primary attacks, "paludismes d'inoculation," having just passed the sexual phase in the body of the mosquito, has been transferred to a new medium: it has thus acquired an enhanced schizogonic potential. The author states that the higher the schizogonic potential of the parasite the greater its vulnerability to drugs. Moreover, most of the parasites in primary attacks are in the circulating blood. Treatment in primary attacks ought, therefore, to be energetic, with the aim of destroying all

the parasites in the circulating blood. In the treatment of relapses it is otherwise; here one should be content to reinforce the resistance of the patient by the creation and maintenance of the "refractory condition" referred to above.

N. W.

FULTON (J. D.). **Studies in the Chemotherapy of Malaria. The Inhibitory Action of Anti-Malarial Drugs on Blood Lipases.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 491–500. With 2 figs. [15 refs.]

Quinine has long been known to inhibit enzymes of varied nature. "With a view to obtaining information as to how a drug acts, an investigation of the influence of various antimalarial drugs on different enzyme systems is being undertaken in collaboration with Sir S. R. Christophers. In the present communication are recorded the results of a study of the inhibitory action of some twenty pure drugs of known constitution and activity on the lipases of rabbit, monkey and human serum." The ingenious method by which the coefficient of inhibition of the different drugs is calculated is clearly described. It was found that a constant value for pH is important in the case of salts, with regard to dissociation to base. The higher homologues of quinine, where the methyl of the methoxy group has been replaced by longer side chains, are the most active inhibitors. This is especially true for human lipase. This greater inhibitory power is associated with a low partition ratio between red cells and serum; the haemolysing power of these drugs for red cells is reduced by the presence of serum.

A highly technical study of this nature does not lend itself to summary. Those interested will study this contribution with profit.

N. W.

RICHARDSON (Shaler). **The Toxic Effect of Quinine on the Eye.**—*Southern Med. J.* 1936. Dec. Vol. 29. No. 12. pp. 1156–1163. With 5 charts. [20 refs.]

This paper deals at some length with the literature of cases of amaurosis and amblyopia resulting from the administration of quinine. Nine cases are reported. The possibility of congenital blindness being caused by the administration of quinine to the expectant mother has to be considered. Animal experimentation suggests that the toxic effect of quinine on the ganglion cells of the retina is the primary cause of the damage done in these cases; the vasoconstriction of the retinal vessels is a secondary cause. In treatment the use of vasodilators is recommended and the suggestion is made that sympathectomy might give good results in cases with persistent contraction of the visual fields and impaired vision.

N. W.

MALDONADO SAMPEDRO (Mariano). **La totaquina en la terapeutica del paludismo. [Totaquina in the Treatment of Malaria.]—*Medicina Paises Calidos.*** Madrid. 1936. Aug.–Sept. Vol. 9. Nos. 8 & 9. pp. 353–364.

The Anti-Malaria Institute of Navalmoral de la Mata in Spain was one of the centres selected by the Malaria Commission of the Health Organization of the League of Nations to carry out comparative tests of the efficiency of totaquina in the treatment of malaria. Totaquina

is a standardized preparation of the total alkaloids of cinchona bark, containing not less than 15 per cent. of quinine. This report from that Institute records the results of the treatment of 54 cases, 35 benign tertian and 19 malignant tertian. In benign tertian cases the action of totaquina is comparable with that of quinine. In malignant tertian cases the drug is of less value, in the doses employed, and the author is of the opinion that it would be necessary to associate with it some drug with gametocidal properties, such as plasmoquine. Relapses were frequent in both types of infection but not markedly more so than is commonly observed with short courses of quinine treatment.

N. W.

GOLSE (J.). Pharmacologie de la médication antimalarique. Le quinquina et ses alcaloïdes. Succédanés synthétiques. [**Pharmacology of Drugs used in Treatment of Malaria : Quinine and its Alkaloids : Synthetic Remedies.**—*Jl. Méd. de Bordeaux*. 1937. Mar. 6-13. Vol. 114. Nos. 10-11. pp. 309-327.

The title of this contribution sufficiently indicates its nature. It is an interesting article though it contains nothing original. N. W.

WALLACE (R. B.). **The Control of Malaria on Estates by Mass Treatment with Atebrin.**—*Malayan Med. Jl.* 1936. Dec. Vol. 11. No. 4. pp. 187-213. With 21 charts.

The title of this well documented paper sufficiently describes its scope. On certain estates since 1933 the mass treatment of the populations with atebrin has been the sole measure of malaria control employed; in others this measure was used to reinforce attempted control by antilarval measures. For five successive days two tablets of atebrin were given at the morning muster to each adult; in the afternoon one more tablet of atebrin and one tablet of plasmoquine simplex (0.01 gm) were given. One tablet of plasmoquine simplex was given alone on the sixth and the seventh days. After this initial intensive treatment a "follow-up" treatment, which consisted of a weekly dose of three or four tablets of atebrin, on one or on two days a week, was started. In some cases this was continued for as long as four months. The malaria rate was practically *nil* during the period of administration. Many thousands of coolies were treated and no serious toxic effects were noted. The author does not contend that mass treatment is the best method of controlling malaria under all conditions; it is, however, a method of value and in certain conditions it may be the method of choice. N. W.

LEGA (Giulio) & CASINI (Guido). L'azione dell'atebrina nella malaria, specialmente in rapporto alle recidive. [**Atebrin in the Treatment of Malaria with Special Regard to Relapses.**—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 6. pp. 404-413. English summary.

The chief interest of this report on the treatment of malaria with atebrin lies in the fact that the 15 cases reported were kept under observation for two and a-half years. Ten were *vivax* infections, five *falciparum*. Atebrin was given daily for seven days: the treatment was repeated whenever relapse occurred. The usual daily doses (0.3 gm. for adults, 0.15 gm. for children) were employed.

In no case was a relapse observed within 15 days of the last febrile attack: in 4 cases there were relapses within the first two months, in 8 cases between the 7th and 10th months. In the *falciparum* infections the first relapse was followed by the complete disappearance of infection: in the *vivax* infections the first delayed relapse was quickly followed by another attack. The duration of benign tertian infections was from 10 to 18 months in most cases; in one case it ceased in the third month and in two it was prolonged to 29 months. No clinical manifestation of subtertian fever was noted later than ten months after the initial atebirin treatment; infection rarely persisted more than eight months.

N. W.

SCHECHTER (Abraham J.) & TAYLOR (Haywood M.). **Atabrine Pigmentation.**—*Amer. Jl. Med. Sci.* 1936. Nov. Vol. 192. No. 5. pp. 645-650. [23 refs.]

This is a description of the atebirin pigmentation that commonly follows the administration of that drug and a discussion of the difficulties of diagnosis to which it might give rise in the absence of a history of malaria treatment. Mild jaundice, pernicious anaemia, the yellow pigmentation of carotinaemia, Addison's disease, subacute bacterial endocarditis, yellow fever and pigmentation from picric acid, such as occurs in TNT workers, are among the conditions that may be more or less simulated. Atebrin pigmentation is diffuse and most evident on the dorsum of the arms, hands and feet; it is also clearly seen on the forehead and face. The authors have failed to note any significant degree of discolouration of the sclerae. They believe that anaemia is of importance as a contributory cause of pigmentation. Occasionally the pigmentation is persistent: four cases showed pigmentation 6 weeks after the final dose of atebirin, one 8 weeks, one 16 weeks, and two 18 weeks.

The tests for atebirin in the urine are simple and reliable. The test used by the authors is a modification of that of TROPP and WEISE [this *Bulletin*, 1934, Vol. 31, p. 171]. They use hydrochloric acid for extraction of the atebirin from the ether, instead of sulphuric acid as recommended by TROPP and WEISE, thus avoiding the possibility of confusion arising from the presence of quinine, quinidine or even plasmoquine. Their method is fully described.

N. W.

SIEGENBEEK VAN HEUKELOM (A.) & OVERBEEK (J. G.). *Behandeling van de acute malaria-aanval met atabrine pro injectione.* [**Treatment of Acute Cases of Malaria by Atebrin Injections.**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1936. Vol. 25. No. 3. pp. 315-330. With 3 figs. [31 refs.] English summary.

"Review of results obtained by intramuscular injections of atebirin in 119 cases of acute malaria between Aug. 5, 1935, and May 13, 1936. A series of 100 cases, containing subtertian 62, benign tertian 16, quartan 5 and mixed infections 17, occurring in 17 natives, 11 Chinese, 8 Japanese, 1 Arab and 3 white or Eurasians, has been compared with a similar series, treated at the same hospital (C. B. Z. Batavia) between Aug. 5, 1931, and May 13, 1932, with the routine oral chinine method.

"With atebirin injections fever disappeared within 48 hours in 87 per cent., with chinine in 77 per cent. of cases. The difference has no value statistically.

"Intoxications, as described in several English papers, are discussed at large. As yet no clear cases of intoxication are observed at Batavia. In two patients epileptiform insults occurred; both died. Clinical and post mortem findings however proved pre-existent disease of the brain. In patients having cerebral symptoms, intramuscular administration of atebirin is to be considered very carefully. One patient developed a troublesome religious mania; further observation revealed schizophrenia. No other cases of cerebral excitation are on record.

"Local reactions, abdominal spasms or frontal pains were not heard of. Yellow discoloration of the skin occurred only twice. As many patients with severe anaemia are included in this series, special attention was given to the "knocked out feeling," described by Vardy. Although a rather sharp decline of haemoglobine occurred in several cases, no such feeling was complained of by our patients.

"Intramuscular atebirin has no effect whatever on subtertian gametocytes.

"Atebrin, as given in this series, twice 300 mg. intramuscular, is not sufficient to prevent relapses. The best after-treatment is still sought after.

"A special warning is given against the simultaneous use of plasmochin and atebirin.

"As clinical evidence about the frequency of severe intoxications is still of a contradictory character, mass-treatment by atebirin injections should be discouraged."

CHIN (Koyu). Ueber die pharmakologische Wirkung des Atebrins. [**Pharmacological Action of Atebrin.**].—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1937. Jan. Vol. 36. No. 1 (382). [In Japanese pp. 138-159. With 6 figs. [17 refs.] German summary pp. 159-160.]

The author states that whilst the action of atebirin in malaria has been studied the pharmacological action of the drug has not been investigated systematically up to the present. The results of his investigations show that—atebrin acts chiefly on the central nervous system. The M.L.D. for frogs and mice is 0.2 mgm. per gram bodyweight when injected subcutaneously, for rabbits it is 8 mgm. per kilo. bodyweight when injected intravenously. In rabbits atebirin produces irregular respirations, which become arrested fairly quickly. The excised hearts of frogs and rabbits are paralysed by atebirin chiefly by action on the heart muscle itself. The peripheral blood vessels of the frog are contracted by atebirin, whilst the ear blood vessels of the rabbit are dilated for a long time: this result is probably due to atebirin acting directly on the muscles of the blood vessels. Acting on the pregnant and non-pregnant uterus of the rabbit and guinea-pig in small doses atebirin stimulates, but in large doses it has a paralysing action after initial stimulation. In nerve muscle preparations of frog's gastrocnemius atebirin depresses the excitability of motor nerve endings.

E. D. W. Greig.

SALAH (M.). Investigations on the Treatment of Malaria with Atebrin.—*Jl. Egyptian Med. Assoc.* 1936. Dec. Vol. 19. No. 12. pp. 717-736. [25 refs.]

CHOPRA (R. N.), SEN (B.) & ROY (A. C.). **Individual Variations in the Effectiveness of Synthetic Anti-malarial Drugs (a Preliminary Note).**—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 131–135.

The authors describe seven cases of malaria in which the administration of atebirin or plasmoquine, or both, was not attended with the results that experience leads one to expect. The cause was defective absorption. This may be due to heavy hookworm infection, or hypochlorhydria, which is commonly associated with dysentery and colitis, or the rapid passage of the drug through the small intestine in chronic diarrhoeas and dysentery. Acute or chronic inflammation of the mucous membrane of the intestinal tract modifies absorption. It is open to question whether the combination of atebirin and plasmoquine in the dragées used renders the absorption of the individual drugs more difficult. In some of the cases cited atebirin was not absorbed when administered in the combined form though it was subsequently absorbed when given alone. N. W.

VAN NITSEN (R.). Le traitement de la malaria par le paludex, nouveau dérivé quinoléinique. (Etude basée sur 1,000 observations d'indigènes.) [**Treatment of Malaria with Paludex, a New Quinoline Derivative. Study based on 1,000 Native Cases.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. Sept. 30. Vol. 16. No. 3. pp. 387–407. With 3 graphs.

— & SERRA (D.). Le paludisme chez les Européens traités par le paludex. [**Malaria in European Patients treated with Paludex.**]—*Ibid.* pp. 409–428. With 1 chart.

Paludex is a copper containing organic preparation, prepared in the "Meurice" Laboratories of the Union Chimique Belge. It is described as copper oxyquinoline sulphonate of soda; a greenish amorphous powder soluble in water, neutral reaction and stable in ordinary conditions of temperature and humidity. The daily dose recommended approximates 0.02 gm. per kilogram of bodyweight for adults, and relatively somewhat bigger doses for children. For an adult of 70 kilograms or over the dose is 1.50 gm. It is given in divided doses and in tablet form, each tablet containing 0.20 gm. of paludex.

If all the claims in this paper, based on the observation of a very large series of cases, be substantiated, paludex compares very favourably with any drug that has hitherto been used in the treatment of malaria. It is said to be equally effective in the treatment of all three forms of the disease; the great majority of cases treated were *falciparum* infections. Schizonts and gametes of all varieties of parasite disappear from the peripheral blood under treatment: after six days' treatment schizonts had disappeared from the blood of 93 per cent. of the cases treated; gametes from 87 per cent. Fever is quickly controlled. In only six cases of a series of 163 had treatment to be prolonged more than seven days: in such refractory cases the authors have combined paludex with quinine with good results. They assert that small doses, 0.50 gm. of quinine with from 0.60 to 1 gm. of paludex a day, are more effective than are the normal doses of either drug taken alone. No symptoms of intolerance have ever been observed even with doses of paludex larger than those recommended: it has been retained and absorbed in cases in which vomiting has been

troublesome. It has, moreover, a well marked tonic effect. A ten days' course of treatment, 1.50 gm. a day, followed, after an interval of from six to eight days, by a similar ten days' course, has frequently been given with no untoward happenings, and with good results. Observations have not been sufficient to determine the frequency of relapse after treatment with paludex.

A number of illustrative cases are described and temperature charts are given.

The paper would have perhaps gained in value had it been possible to have treated an equivalent number of unselected cases with quinine alone, to serve as a control. It is also regrettable that the diagnosis of the form of parasite was not made in each case; as stated, the vast majority of cases appear to have been malignant tertian infections.

N. W.

VAN NITSEN (R.). Contribution à la chimiothérapie du paludisme. [**Chemotherapy of Malaria.**]—*Bruxelles-Méd.* 1937. Feb. 14. Vol. 17. No. 16. pp. 587-592.

This is a further communication on the results obtained in the treatment of malaria with paludex (see above). More than two thousand cases have been treated with very satisfactory results. Paludex is stated to act on both schizonts and gametes. The author now gives slightly increased doses. For an adult one gramme is given by mouth the first day, 1.20 gm. the second, the dose being increased by 0.20 gm. a day till the sixth day, when 2.0 gm. are given. This dose of 2 gm. can be continued for several days if necessary. Still better results are obtained by the association of quinine with paludex, quinine 0.50 gm. and paludex 1.00 gm. for six days. A second similar treatment is given after an interval of from 8 to 14 days. The action of this combination is more rapid than that of either of its constituents. Whenever quinine is contraindicated paludex is given alone.

N. W.

REYNTJENS. Note sur des essais thérapeutiques anti-malariens par le quinimax. [**Treatment of Malaria with Quinimax.**]—*Bull. Méd. du Katanga.* 1936. Vol. 13. No. 3. pp. 97, 99-103.

VAN NITSEN (R.). Le quinimax dans le paludisme des nourrissons indigènes. [**Treatment of Native Children with Quinimax.**]—*Ibid.* pp. 114-15, 117-19.

A tablet of quinimax contains chlorohydrate of quinine 4 cgm., and a mixture of the chlorohydrates of quinidine and cinchonidine 1 cgm. Ampoules containing the same doses per cc. are used for hypodermic medication. Dr. Reyntjens obtained disappointing results in the treatment of a series of malignant tertian cases by subcutaneous injection and the tablets were of no appreciable value as a prophylactic. Dr. van Nitsen treated 58 infants infected with *falciparum*. He considers that 15 cgm. of quinimax has a therapeutic value comparable to that of 25 cgm. of quinine chlorohydrate.

N. W.

SPAAR (Eric C.). The Therapeutics of Malaria.—*Jl. Trop. Med. & Hyg.* 1937. Jan. 15. Vol. 40. No. 2. pp. 13-15.

RIOLO (Pietro); SERIO (Francesco). Sulla cura di Maurizio Ascoli nelle infezioni malariche. Nota II. Stabilità dei risultati. Bonifica umana [RIOLO]. Nota III. Associazione con la chinina nelle correnze febbrili. Bonifica umana [RIOLO]. Nota IV. Resistenza e ipersensibilità [SERIO]. [*Ascoli's Treatment of Malaria Infections. II. The Lasting Quality of the Results. III. Association with Quinine in Febrile Relapse. IV. Resistance and Hypersensitiveness.*—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 6. pp. 414-415; 416-422; 423-427. [13 refs.]

In 1935 Riolo reported the results of treatment of 18 cases of chronic malaria with splenomegaly by intravenous injections of adrenalin (see this *Bulletin*, 1936, Vol. 33, p. 276). In Note II he states that 15 of the 18 patients have been followed up and nearly two years after the termination of treatment the general health of all is excellent. None has suffered from relapses and the size of the spleen remains within the limits noted at the end of treatment.

Note III is a record of the treatment of twenty cases of chronic malaria, all the victims of frequent relapses. The treatment was started in each case during such a febrile relapse. Treatment with adrenalin injections was supplemented with quinine given by mouth, six 20 cgm. tablets a day, at hourly intervals, as long as the fever lasted. The results were uniformly good. The patients were kept under observation for a year, at the end of which time only one patient had a spleen that was palpable. Both *vivax* and *falciparum* infections were treated. The authors consider that by this treatment complete eradication of infection can be secured.

Note IV, by Serio, is a description of two exceptional cases, the first showing remarkable resistance to the adrenalin treatment, the second unusual hypersensitiveness to adrenalin. In the former no less than 52 injections of 1/10 mgm. were required, in the latter an injection of 1/20 mgm. caused severe symptoms necessitating a return to 1/50 mgm. doses. The ultimate results of treatment in both cases were excellent. N. W.

POMILIA (Giovanni). Sulla cura di Maurizio Ascoli nell'infezione malarica. [*Ascoli's Method of Treatment of Malaria Infections.*—*Riv. Sanitaria Siciliana*. 1936. Dec. 15. Vol. 24. No. 24. pp. 1360, 1363-4.

The author describes the treatment of six cases of chronic malaria with enlarged spleens by Ascoli's method—the daily intravenous injection of adrenalin, for 20 days, in doses from 1/100 to 1/10 of a milligram. He writes with enthusiasm of the results obtained and considers the treatment as a most valuable addition to malaria therapy. The maximum dose was well supported in all cases save one: this patient suffered from chronic appendicitis and the injection of 1/10 mgm. of adrenalin gave rise to severe but transitory abdominal cramp. N. W.

GOSIO (Renato). Su di un nuovo capitolo di terapia della infezione malarica. [*Ascoli's Treatment of Malaria Infection.*—*Polisclimico*. Sez. Prat. 1937. Feb. 8. Vol. 44. No. 6. pp. 265-6, 269.

A short discussion of the mode of action of the treatment of chronic malaria infection by the intravenous injection of adrenalin. N. W.

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LEPROSY.

MUIR (Ernest). **The Control of Leprosy. The Charles Franklin Craig Lecture of the American Society of Tropical Medicine.**—*Amer. J. Trop. Med.* 1937. Jan. Vol. 17. No. 1. pp. 51-58.

This lecture summarizes very well the present position of the leprosy problem. Compulsory segregation is condemned as leading to the easy concealment of patients, the diagnosis in whom may sometimes be difficult in any case. Much has been learnt from surveys, which revealed the real number of cases in India to be up to ten times as many as the obvious ones recognized by non-medical census enumerators. Although the value of treatment has sometimes been exaggerated it is certainly more effective in leprosy than in tubercle, and its chief value is in gaining the confidence of the patients and rendering their follow-up and the tracing of contacts easy, and thus greatly simplifying its control through education of the people in simple measures of household and village isolation of the infective cases, which are not more than one-fourth of the whole number. The decline of leprosy in England in the Middle Ages is attributed largely to the segregation of patients in the 250 leper hospitals then existing. In West Africa, Muir found the native chiefs recognized leprosy readily, but had completely wrong ideas regarding infectivity; for they look on the crippled nerve cases as the most, and the nodular type as the least, dangerous. Here education again is essential for control measures. They also thought it safe for children to mix with lepers, as they did not recognize their infection in childhood with development of the disease mainly during adolescence. The success of segregation in Norway was due to a wisely planned campaign in a civilized country with a well developed health service, so a carefully planned programme in accordance with social conditions is essential in each leprous country. The propaganda-treatment-survey plan has proved successful in India. In Nigeria, with 200,000 cases, or 1 per cent. of the population, leper villages are of value in addition to the more costly settlements. In the Philippines clinics and local leprosaria have wisely been provided. Improvement of hygienic conditions is of great importance, but necessarily a slow process in backward poor areas. A good diet with sufficient vitamins is also of value. The use of these measures may in time open the door towards public health and social reform.

L. Rogers.

LOWE (John). **The Epidemiology of Leprosy.**—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 160–166. With 2 maps & 4 graphs.

This general account of the subject is in close agreement with current opinion. In a brief historical survey, based largely on the book of ROGERS and MUIR, the author found no satisfactory explanation of the decline of leprosy in Europe. Transmission is through direct contact with infectious cases, due, he thinks, most probably to insects. Maps are given of the rough general distribution in hot damp climates of the world, and that of India based on recent surveys with a very similar relationship to climate. He is also in agreement with others regarding age and sex distribution, the excess in males being difficult to explain. The predisposing effects of poor diet and social conditions are stressed. The most important point in control is the prevention of contact of children with infectious cases. L. R.

FLANDIN (Ch.) & RAGU (Jean). Origine, mode de contagion, durée d'incubation de la lèpre dans 95 cas dont 6 contractés dans la région parisienne. Traitement par les injections intraveineuses du complexe chaulmoogra-cholestérol. [**Leprosy: Its Source, Mode of Infection and Length of Incubation Period. Treatment by Intravenous Injection of Chaulmoogra and Cholesterol.**].—*Bull. Acad. Méd.* 1937. Mar. 16. 101st Year. 3rd Ser. Vol. 117. No. 11. pp. 337–343.

This is an instructive study of 26 leprosy patients in the Saint-Louis Hospital and 69 more in Paris and its neighbourhood. The great majority were infected in French Colonies, including 22 natives, 9 half-castes, 17 whites born in, and 41 who had visited, leprosy infected colonies, and only 6 whites who had never left France. Details regarding the conditions under which the last six contracted the disease show that two of them had lived in close contact with Chinese and Annamites in Paris, and of the remaining four, three contracted the infection through cohabiting with an infective leper woman; and the fourth was a young girl who had married a white leper, with periods of only six to eight months of sexual contact before signs of the disease were observed. He concludes that under ordinary social conditions in France the danger of contracting leprosy is too slight to necessitate segregation measures and compulsory notification. He had previously reported good results from treatment with a combination of chaulmoogra and cholesterol, which removes infectivity and is attracting cases to come for treatment who would only hide themselves under a compulsory isolation system. L. R.

FABRE (Maurice). Léproserie de Valbonne. [**The Valbonne Leprosarium.**].—*Rev. d'Hyg. et de Méd. Préventive.* 1936. Dec. Vol. 58. No. 10. pp. 758–764. With 2 figs.

This is a brief general account of a small isolated leprosarium founded to accommodate some of the lepers from the Paris Hôpital Saint-Louis.

L. R.

CLOUSTON (T. M.). **Age Groups of Leper Patients at Nauru.**—*Leprosy Review*. 1937. Jan. Vol. 8. No. 1. pp. 23-29.

The complete control of the small population of Nauru Island during the serious outbreak of leprosy makes the data of great importance. In this note 284 isolated bacteriologically positive cases and 193 early negative ones treated as out-patients are analysed as regards age and sex. In the later years the number of new positive cases has greatly decreased, but negative early ones not to the same extent. This is attributed largely to the segregation of the infective cases at the earliest possible moment, due to frequent examinations of all the small population for the first symptoms [as advocated for the island by the reviewer over a decade ago] having removed a source of infection, especially for the children. The fewer cases now reaching the infectious stage is considered to point strongly to the advisability of early and continued treatment, for only four originally non-infectious cases have gone on to nodular formation under treatment, and in the last six years, five have become infectious skin cases, but not nodular ones. Further, only 17, or 6 per cent., of early infectious cases on admission have advanced to the nodular stage under treatment, but 32 cases at some time nodular have been released after becoming bacteriologically negative, or approximately 11 per cent., and 12 more cases have lost their nodules.

The sex incidence shows a ratio of 1.2 males to 1.0 females admitted to segregation, and of 1.41 females to 1.0 males in clinic cases. The relapse rate has been only 8.8 per cent. readmitted to segregation, less than elsewhere, and 8 of 9 recent ones gave negative leprolin tests by Muir's technique, indicating a lowered resistance. In nerve cases in the clinic the relapse rate appears to be very low, and to the ease with which regular and prolonged treatment can be carried out on this small island this good result is attributed.

As regards age, approximately 55 per cent. of the segregated cases could have been infected before the age of 15 years and about 45 per cent. were definitely infected before that age. At least 20 per cent. were over 25 on the first signs appearing, and 15 per cent. over that age when first exposed to infection.

The present situation on the island shows only 57 segregated and 102 clinic cases, or a total of 159 under treatment, approximately 10 per cent. of the population. This "contrasts very favourably with the figure of almost 30 per cent. in 1924 and 14 per cent. at the end of 1933."

L. R.

BECELLI (Luiz Marino). **Contagio conjugal na lepra.** [**Leprosy from Conjugal Association.**].—*Rev. Brasileira Leprologia*. S. Paulo. 1936. Vol. 4. Numero especial. pp. 349-354. [10 refs.]

From a study of 506 cases in which one of the married couple was a leper the author has traced infection to the partner in 49, or 9.7 per cent. Further, infection by conjugal contact nearly always occurred, as one would expect, in the earlier years of cohabitation. That the infection is not more often acquired is ascribed by the author to lessened receptivity in adult life, or to the possibility that frequently repeated contagion leads to the development of a certain degree of immunity.

H. H. S.

WILSON (R. M.). **Marriage among Lepers.**—*Internat. Jl. Leprosy.* Manila. 1936. Oct.-Dec. Vol. 4. No. 4. pp. 441-443.

The author reports further favourable results from allowing recovered lepers to marry after sterilizing the males, but allowing them to adopt one child from the colony. Three years' experience finds the eleven families happy and well. On the other hand, of seventeen couples who married without permission, or sterilization of the men, within about a year nine children were born, but no more after the men were promptly vasectomized. Meanwhile four mothers relapsed under the strain of pregnancy and lactation, and no orphanages have been found to take the babies.

L. R.

BRITISH EMPIRE LEPROSY RELIEF ASSOCIATION. **Leprosy : a Problem of Colonial Development. Report for 1936.**—32 pp. With 11 figs. London : 131 Baker Street, W.1.

This report deals with the work carried out in African and many other British Possessions other than India, which the Indian Council report covers. It includes brief accounts of Dr. Muir's West African tour already dealt with in reviews of *Leprosy Review*, and the Leprosy Exhibition of the Association which visits various towns and arouses much interest. The work of the Toc H volunteers, mainly in West Africa, is also favourably reported on.

L. R.

LEPROSY REVIEW. 1937. Jan. Vol. 8. No. 1. pp. 1-50. With 7 figs. (1 map) on 4 plates.—Quarterly Publication of the British Empire Leprosy Relief Association, 131 Baker Street, London, W.1. [1s. 6d.]

The number commences with a leper survey of the Arabian Peninsula by W. H. STORM, who reports that although a few cases can be found in any area, it is only in the southern end of the peninsula in Yemen and Wadi Ooan and in Ohufar that definite foci of infection have been found. Yemen cases are to be met with in the Aden Protectorate.

A lecture by H. C. DE SOUZA-ARAÚJO on Leprosy in Brazil covers ground dealt with by him in previous years. He has submitted a plan for the national control of the disease to the Government. The article on Leprosy in Ceylon by R. G. COCHRANE also deals with work already published.

C. M. HASSELMANN records a case, illustrated by a photo and a microscopical section, of adenoma sebaceum et acanthoides cysticum, which might easily be mistaken for an advanced case of nodular leprosy of the face until the microscope reveals an enormous increase in the sebaceous glands with adenomatous and cystic changes.

A report of the Sudan Medical Service for 1935 shows a total of 10,711 lepers including an estimated excess of 2,250 over the known cases. 4,210 are under treatment and 4,251 under observation. Camps and settlements contain 390 segregated and 2,308 additional ones under treatment. New settlements are being formed and voluntary settlements near dispensaries were to be opened in 1936. It is reported the percentage that had been rendered quiescent has risen from 31 per cent. in 1932 to 78 per cent. in 1935, but the stage has been reached in which further chaulmoogra treatment is of no avail in cases under observation prior to 1933-34. Few advanced cutaneous and mixed cases respond to treatment. Methylene blue

has proved disappointing in advanced cases. Less than 10 per cent. of the cases are considered to be a danger to their neighbours. "Treatment is effective and worth trying in a large percentage of active early cases over a period not exceeding four years. The settlements have removed the chief foci of infection in the district, and both centralized and simplified their control."

The Public Health Report of S. Rhodesia for 1935 records that 1,311 cases were treated in two large government settlements and 48 more in a small mission one, and the admissions in that year numbered 249. The total cared for has risen from 508 in 1929 to 1,359 in 1935, mostly volunteers. The settlements are looked on as curative hospitals and 319 were discharged last year as "arrested" cases.

In Nyasaland the annual report showed 213 admissions, 131 discharged and 47 deaths. Queensland had 63 segregated patients at the end of 1934.

An important paper on leprosy in Nauru Island is dealt with separately. L. R.

LEPROSY REVIEW. 1937. Apr. Vol. 8. No. 2. pp. 51-100. With 9 figs. on 2 plates. Quarterly Publication of the British Empire Leprosy Relief Association, 131 Baker Street, London, W.1. [1s. 6d.]

This number includes a paper on the diagnostic value of gland puncture by H. v. R. MOSTERT based on 80 cases that had been classed as maculo-anaesthetic leprosy with palpable glands. A few drops of saline were injected into a gland, withdrawn again after massaging the gland and stained with Ziehl-Neelsen method. In 13 cases positive results were obtained and on re-examining these patients 8 showed very early nodular infiltration of the face, and 6 of them also erythematous rash on the body and other parts. The remaining 5 positive cases also showed a similar rash or active macular lesions, and subsequent scrapings of the skin of the face proved to be positive. Thus the gland punctures served as a guide to the diagnosis of early cases of nodular retrogression.

The organization of occupational therapy at the Dichpali leper home and hospital is described by George M. KERR. 170 of the 700 patients are being educated, and the remainder were divided into gangs for various forms of domestic and agricultural work, including a malarial gang, who all worked three hours a day. Only a small part of the food supply is yet grown by the men, but it is increasing. The patients realize the benefit to their health from such occupation.

A short description of the India Purulia leper home is contributed by E. MUIR. It includes an independent village occupied by the healthy descendants of former leper inmates as a standing evidence against the old hereditary theory of leprosy.

H. P. LIE contributes a short account of the work of his famous compatriot worker at leprosy, Dr. DANIELSEN, and an obituary notice of Mr. Wellesley BAILEY, the founder of the Mission to Lepers, is also of interest. L. R.

VLACH (Giuseppe). Un caso autoctono di lebbra a Trieste.—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Mar. Vol. 18. No. 3. pp. 175-186. With 12 figs.

MEDULLA (Candido). L'odierna nosografia della lebbra in Cirenaica.—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Mar. Vol. 18. No. 3. pp. 163-174. With 2 figs.

BECHELLI (Luiz Marino). O tempo de incubação da lepra. [**The Incubation Period of Leprosy.**].—*Rev. Brasileira Leprologia.* S. Paulo. 1936. Vol. 4. Numero especial. pp. 355-360.

The author investigated 529 cases but was able to obtain reliable information in 273 only. The average incubation in these was 8.4 years. In 101 it ranged between 6 and 10 years; the minimum was 2 years and the maximum 28. He maintains, therefore, that examination of contacts should be repeated up to 10 years after exposure to possible infection.
H. H. S.

WADE (H. W.). **The Skin Lesions of Neural Leprosy. I. General Introduction. II. Observations in Cebu.**—*Internat. J. Leprosy.* Manila. 1936. Oct.-Dec. Vol. 4. No. 4. pp. 409-430. With 1 fig. [22 refs.]; 1937. Jan.-Mar. Vol. 5. No. 1. pp. 1-30. With 36 figs. on 6 plates.

These papers are detailed descriptions of the pathological changes in the skin in nerve leprosy which should be read in original by those interested. The first of them deals with the material studied, terminology and classification, activity or quiescence of the lesions, technique and the nature of the histological changes in a general manner.

In the second paper the grouping of the lesions in 52 cases is discussed in detail, and the appearances of the skin lesions illustrated by excellent photos of early cases; the primary object "being to determine the essential pathology of the lesser forms of the non-lepromatous lesions of leprosy." Clinically the lesions examined varied from the slightest possible to active major tuberculoid leprides, and it was found that the simpler active leprides are always tuberculoid in some degree. Quiescent lesions retrogressed from active ones also showed slight tuberculoid changes in five of eight cases, but of thirteen residual lesions only three showed tuberculoid foci, and two specimens from nonmacular anaesthetic patches were practically negative. The papulate minor tuberculoid leprides are as a class retrogressive. Three of four diffuse minor tuberculoid lesions showed the usual changes, as did three major ones. "The findings as a whole indicate strongly the constancy of tuberculoid changes in all typical active leprides of whatever clinical variety."
L. R.

CAMPOS (Nelson de Souza) & LONGO (Paulino W.). Atrophia circumscripta aos musculos da eminencia thenar como manifestação inicial e residual da lepra. [**Atrophy of the Thenar Muscles in Leprosy.**].—*Rev. Brasileira Leprologia.* S. Paulo. 1937. Mar. Vol. 5. No. 1. pp. 29-51. With 10 figs. English summary.

The authors have observed and here record five cases of localized wasting of the muscles of the thenar eminence in leprosy. It may come on early, within 2 months of symptoms making their appearance. By carefully carried out electrical reaction tests they found that the terminal motor branches of the ulnar nerve were involved, these going



Showing atrophy of muscles of the thenar eminence in early leprosy
[Reproduced from *Revista Brasileira de Leprologia*]

to the flexor brevis, adductor pollicis and the first dorsal interosseous. [The ulnar, it will be remembered, innervates only the median head of the flexor brevis pollicis, the lateral being supplied by a branch of the median nerve]

H. H. S.

SCHUJMAN (Salomon). **Tuberculoid Lepra Reaction.**—*Internat J. Leprosy*. Manila. 1937. Jan.-Mar. Vol. 5. No 1. pp 77-86. With 18 figs. on 4 plates.

This article has been translated from the *Revista Argentina de Dermatosifilogia* 19 (1935), 411-435, and is illustrated by naked eye and histological appearances. The author has met with seven cases of reactions in tuberculoid leprosy and made bacteriological and histological examinations in five. In three the reactions occurred spontaneously, in one after injections of aniline drugs, and in three after chaulmoogra treatment. The general condition of the patients remained good with no fever, but disturbances of sensibility were marked, and infiltration appeared in the lesions, although they and the

nasal mucosa were usually negative bacteriologically. A frank tuberculoid structure was found in the reacting lesions. Erythrocyte sedimentation was moderate, and the leprolin tests frankly positive; the contrary to nodular lesions, so of diagnostic import. L. R.

WADE (H. W.). Regional Variations of Leprosy with Special Reference to Tuberculoid Leprosy in India.—*Leprosy in India*. 1937. Jan. Vol. 9. No. 1. pp. 3-13. [22 refs.]

COCHRANE (R. G.), DE SIMON (D. S.) & FERNANDO (A. C.). Preliminary Observations on Childhood Leprosy in Ceylon.—*Internat. Jl. Leprosy*. Manila. 1937. Jan.-Mar. Vol. 5. No. 1. pp. 61-65.

MITSUDA (Kensuke) & OGAWA (Masako). **A Study of One Hundred and Fifty Autopsies on Cases of Leprosy.**—*Internat. Jl. Leprosy*. Manila. 1937. Jan.-Mar. Vol. 5. No. 1. pp. 53-60.

The first named writer has performed over 1,000 post-mortems on lepers in the last forty years, and 150 have been done in the last five years, and are summarized. As usual, tuberculosis was the most frequent cause of death with a rate of 54.7 per cent., and the complication occurred oftenest in cutaneous cases weakened by lepra reaction. The disease is usually less acute than in other people, but it has caused from 52 to 55 per cent. of the total deaths in nine years. Kidney disease, as usual, comes second with a total of 13.3 per cent., 4.7 per cent. having been due to uraemia. Septicemia caused 9.8, leprous cachexia 4.0, laryngeal stenosis 1.3 and other causes 17.3 per cent. of the total. The severity of ulcerations and affections of the larynx is attributed to the cold climate. The cutaneous type only showed lesions in the lymph glands and viscera, but nerve cases may also show involvement of the testes and more frequently of the spinal cord and nerve trunks. The vagus is, however, more frequently attacked in cutaneous cases, as are the bones. Tuberculous changes on the viscera are the result of generalization and have no relation to tuberculoid skin changes. L. R.

CERRUTI (Humberto). Os bacillos de Hansen nos tecidos: aspecto interessante na fixação pelo formol. [**Hansen's Bacillus in the Tissues.**]—*Rev. Brasileira Leprologia*. S. Paulo. 1936. Dec. Vol. 4. No. 4. pp. 441-446. English summary (10 lines).

This paper is of interest to those engaged in studying the morbid histology of leprosy. Tissues are usually fixed in one or other of the following fluids: alcohol, 70 per cent.; formol, 10 per cent. in neutralized physiological saline; Zenker, or formol-Zenker (Helly's fluid); Orth-Müller, or Bouin. However good for fixing tissues where the histological changes are to be studied, none of the last four is satisfactory where demonstration of the bacilli is aimed at. For this purpose either of the first two is good in maintaining the alcohol-acid fast properties of the organism. Where vascular organs such as liver or spleen are under investigation, most of the bacilli appear very dark brown or black if formol is used for fixation, particularly if the tissues are placed in the fixing fluid within a short time of death.

H. H. S.

MITSUDA (Kensuke). **The Significance of the Vacuole in the Virchow Lepra Cells, and the Distribution of Lepra Cells in Certain Organs.**—*Internat. Jl. Leprosy*. Manila. 1936. Oct.-Dec. Vol. 4. No. 4. pp. 491-508. With 8 figs. on 2 plates.

The author has studied the distribution of lepra cells, with special reference to lipid degeneration revealed by staining with Sudan III, in lymph nodes, liver and spleen and other organs. He came to the conclusion that the leprosy bacillus invades the histiocytes, causing them to multiply and form vacuolar nodules. In the organs, except the testicles, it does not form tumour-like masses as in the skin, but only small nodules in the liver, spleen and glands and in the suprarenals. He considers that the production in the tissues of lipid substances and vacuoles is peculiar to leprosy, and that chaulmoogra preparations accelerate the production of lipid and the natural degeneration of the bacilli in the cells.

L. R.

ERMAKÓVA (Nína). **Studies on Leprosy. II. Formation, Distribution and Diagnostic Significance of Pigment.**—*Internat. Jl. Leprosy*. Manila. 1936. Oct.-Dec. Vol. 4. No. 4. pp. 445-454. With 4 figs. on 1 plate.

The author reports finding an iron-containing pigment in the affected tissues of old leprosy cases, in large quantity in nodular, but very little in maculo-neural and tuberculoid, which he thinks is of local origin. A considerable degree of phagocytosis was constant. Its presence in tuberculoid leprosy may serve to distinguish such lesions from true tubercle due to Koch's bacillus. The pigment is in the form of haemosiderin.

L. R.

MUNEUCHI (Toshio). **On the Leprous Changes of the Endocrine Organs.**—*Kitasato Arch. Experim. Med.* 1937. Jan. Vol. 14. No. 1. pp. 61-74. With 12 figs. (2 coloured) on 6 plates.

This well illustrated paper can best be summarized in the author's own conclusions.

"Pathological examination of various endocrine glands of 190 autopsied cases of leprosy revealed more or less leprous changes in all the glands. It was only nodular cases which showed lepra cell infiltrations in the glands. In nerve leprosy lepra cell infiltration was seen only in testes and the change was mild and rare. Among the endocrine glands the testes showed the most marked leprous changes. In a nodular case the specific leprotic changes were always noticed, even macroscopically. Adrenal glands also showed almost always small leprous nodules macroscopically. The pineal bodies and ovaries showed fairly marked changes microscopically, but it was usually difficult to notice them by naked eye. The changes in pancreas, thyroid and parathyroid glands were comparatively mild. The changes in the pituitary bodies were the slightest."

L. R.

McKNIGHT (Robert S.) & LINDEGREN (Carl C.). **Bactericidal Effects of Vapors from Crushed Garlic on *Mycobacterium leprae*.**—*Proc. Soc. Experim. Biol. & Med.* 1936. Dec. Vol. 35. No. 3. pp. 477-479.

The following "strains of acid-fast and non acid-fast *Mycobacterium leprae*" were used in these experiments. A non acid-fast yellow strain

obtained from Dr. Beckwith, a non acid-fast orange strain from Dr. Kessel and an acid-fast yellow strain from the American Type Culture Collection. Petri dish agar cultures were spread with a heavy suspension of the organisms and one gram of garlic placed on the inverted cover so as not to be in contact with the cultures, and incubated for three days, together with controls without the garlic after exposing the plates to the garlic vapours for from one minute to two hours. They found that after 32 minutes the growth was markedly inhibited and after an hour or more practically no growth occurred.

L. R.

HAGEMANN (Paul). Fluoreszenzmikroskopischer Nachweis von Leprabakterien im Nasenschleim und im Blut. [**Fluorescence of Lepra Bacilli.**]—*Deut. Med. Woch.* 1937. Mar. 26. Vol. 63. No. 13. pp. 514–518. With 1 fig.

This is a technical paper describing an apparatus for demonstrating fluorescence of lepra bacilli.

L. R.

KEDROWSKY (W. J.). Variabilité du groupe d'actino-mycètes et son rapport à la doctrine de la nature mycélienne des virus de la tuberculose et de la lèpre.—*Giorn. di Batteriol. e Immunol.* 1936. Sept. Vol. 17. No. 3. pp. 289–323. With 4 figs. [20 refs.]

VAN BREUSEGHEM (R.) & MOULES (E.). Pratique de la coloration du bacille de Hansen dans les frottis. [**Staining Hansen's Bacillus.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 137–139.

The authors report that they found the following the simplest and best method of staining lepra bacilli in tissues for the use of their native laboratory assistants. Stain with ordinary Ziehl heated for two to three minutes, or cold for two hours. Decolourize with 1 part of nitric or sulphuric acid to 9 parts of 95 per cent. alcohol, and re-stain for 30 seconds with Kuhne's blue.

L. R.

EDDY (Bernice E.). **Attempted Cultivation of *Mycobacterium leprae*.**—*Internat. Jl. Leprosy.* Manila. 1937. Jan.–Mar. Vol. 5. No. 1. pp. 31–43. [18 refs.]

The author records negative results from the use of 68 culture media enumerated in his paper. The bacilli may persist for long but no evidence of their multiplication could be obtained.

L. R.

DUBOIS (A.), GAVRILOV (W.) & VAN BREUSEGHEM (R.). Injection intradermique de bacilles de Kedrowski chez le lépreux et le non-lépreux. [**Intradermic Injections of Kedrowski's Bacillus.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. Dec. 31. Vol. 16. No. 4. pp. 483–486.

The researches of MITSUDA, confirmed by others, show that the intradermic injection of killed lepra bacilli of Hansen and of rat leprosy bacilli of Stephansky give reactions in patients with nerve leprosy with few bacilli and in recovered cases, but not in active cutaneous cases containing numerous bacilli. The authors tried similar tests

with Kedrowski's bacillus but obtained different results in leprosy cases. They therefore agree with HAYASHI and MUIR that Kedrowski's organism is not closely related to that of leprosy. L. R.

MENDES (Ernesto) & GRIECO (Vicente). Interpretação da reacção leprotica suas relações com a parallergia. [**Parallergy and the Leprotic Reaction.**]—*Rev. Brasileira Leprologia*. S. Paulo. 1936. Vol. 4. Numero especial. pp. 1-25. [17 refs.] English summary.

The lepra reaction is often explained by sensibilization of an allergic subject by the specific agent, *Myco. leprae*, i.e., by allergy. On the other hand it is by no means infrequently seen in those with mixed or tuberculous leprosy where the organisms may be relatively few, and it may occur apart from definite incitement by the organism, for example, intercurrent disease, physiological disturbance such as onset of menstruation, appendicitis, dental sepsis and so forth. To this condition—reaction of a person in a state of allergy to non-specific agents, protein or otherwise, but differing from the specific antigen producing the allergy—the authors (with MORO and KELLER) apply the term "parallergy." H. H. S.

ISHIBASHI (Takeo). Beiträge zur Serologie der Lepra, mit besonderer Berücksichtigung der für die Komplementbindungsreaktion bei Lepra wirksamen Antigene. Nebst serologischen Untersuchungen an Seren von mit säurefesten Bazillen immunisierten Kaninchen. [**Complement Deviation and other Serological Tests in Leprosy.**]—*Tohoku Jl. Experim. Med.* 1937. Jan. 30. Vol. 30. Nos. 3 & 4. pp. 287-314. [10 refs.]

The author reports on elaborate investigations of the complement deviations with antigens prepared from various acid-fast bacilli from those of the different varieties of tubercle to smegma bacilli, and also on agglutination reactions with the sera of rabbits immunized against such antigens. The following are the most important results obtained. The Wassermann reaction by Kolmer's method in 138 cases of leprosy was positive in 22.5 per cent., varying from 39.7 per cent. in nodular cases to 3.7 per cent. in nerve ones. A saline emulsion of ether soluble fractions of acid-fast bacilli gave positive reactions in 90.9 per cent. of nodular and 83.7 per cent. of nerve cases. With an antigen made from the avian tubercle bacillus positive reactions were obtained in 78.9 to 91.1 per cent., so he regards this antigen as of diagnostic value. Agglutination reactions with the sera of his immunized rabbits were positive in dilutions of from 320 to 1,280 with different preparations.

L. R.

PIMENTEL IMBERT (M. F.). **Rubino's Reaction in Leprosy.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1936. Dec. Vol. 12. No. 2. pp. 257-266. With 2 figs. on 1 plate. [10 refs.] [Spanish version pp. 246-256.]

This is a good account of the history and present position of the Rubino test. The author has used Rubino's latest method with a

double series of three tubes, each containing respectively increasing dilutions of serum, fresh blood formalinized corpuscles, and non-formalinized corpuscles to serve as a control, with the following results:—

“ We tested Rubino’s reaction in 278 sera : 47 from lepers, 214 from cases suffering from other conditions, and 17 from apparently normal individuals.

“ The agglutino-sedimentation of sheep’s red blood cells formalinised (or Rubino’s reaction in its latest form) gave us a percentage of 70·21 per cent. positive reactions in all cases of leprosy studied by us.

“ The nodular form of leprosy gave a percentage of 86·21 positive reactions ; mixed leprosy, 70 per cent. ; nerve leprosy, 62·4 per cent. There was no reaction in non-leprous cases.”

L. R.

LAMBORN (W. A.). **The Haematophagous Fly *Musca sorbens*, Wied., in Relation to the Transmission of Leprosy.**—*Jl. Trop. Med. & Hyg.* 1937. Feb. 15. Vol. 40. No. 4. pp. 37–42. [15 refs.]

The author records further work on the rôle of insects in transmitting the infection of leprosy, which he believes to be very important. He quotes previous work indicating that *M. domestica* may carry lepra bacilli from open cases to infect other skin lesions, but thinks non-biting blood-drinking flies require further investigation in this connexion. He has therefore worked with *M. sorbens* in Nyasaland, which prefers to feed on blood serum or pus of open sores or mucous membranes, including leprous ones. He has found lepra-like bacilli in their excreta after a feed on leprous ulcers, which may thus be carried to ordinary sores, cuts or abrasions, or the mucous membrane at orifices such as the nose, which these flies affect.

L. R.

COSTA (Henrique de Moura). As doses fortes de chaulmoogra no tratamento da lepra. [**Large Doses of Chaulmoogra in the Treatment of Leprosy.**]—*Rev. Brasileira Leprologia.* S. Paulo. 1937. Mar. Vol. 5. No. 1. pp. 67–86. English summary.

The author’s findings and observations are based on 62 patients only, 44 adults and 18 children. His results are presented mostly in the form of protocols, giving the stage of disease, the time of treatment, the amount of the drug used and the results, whether improved or stationary, and the continued presence or diminution or absence of bacilli. He tested also the effects of the larger doses on the rate of corpuscle sedimentation. For the details given in the many tables the original must be consulted. His method of procedure and the results may be summed up as follows:—

For adults, if the usual dose was 5 cc. weekly, he gave 10 or even 15 cc. two or three times in the week, and for children 0·6–0·9 cc. per kilo. per week in place of 0·2–0·3 cc. This treatment was maintained in some cases for two years, the tolerance being good. There were no instances of toxic symptoms, nearly all patients increased in weight, and their blood sedimentation rate was increased, and clinically the improvement was much more marked than with the smaller doses and especially in children.

H. H. S.

- i. MERCKEN (G.). Essai de traitement de la lèpre par injections intraveineuses de bleu de méthylène. [**Methylene Blue Intravenously in Treatment of Leprosy.**—*Ann. Soc. Belge de Méd. Trop.* 1936. Dec. 31. Vol. 16. No. 4. pp. 493–501. With 1 fig.
- ii. OCCHINO (A.) & KERNKAMP (Y.). Le bleu de méthylène dans le traitement de la lèpre. [**Methylene Blue in Treatment of Leprosy.**—*Ibid.* pp. 503–506.

i. The author reports amelioration of nerve symptoms and pain for a time following this treatment up to a maximum of three months, but no effect on the general evolution of the disease. He treated 34 cases.

ii. These workers treated 22 cases and noted after doses exceeding 30 cgm. violent and depressing, but not dangerous, reactions, while the therapeutic value of the treatment was absolutely nil. L. R.

BRAGA (Renato). Tratamento das ulceras leproticas por injeções intrarteriaes. [**Treatment of Leprotic Ulcers by Intra-arterial Injection.**—*Rev. Brasileira Leprologia.* S. Paulo. 1936. Dec. Vol. 4. No. 4. pp. 447–467. With 11 figs.

The treatment adopted, arterial injection of 1 per cent. methylene blue in quantities of 5–10 cc. at weekly intervals, has given good results in the author's hands. The technique is no more difficult than intravenous injection, and he has so far employed the method in ulceration of the legs. He gives details of seven patients and illustrations of five. [Intra-arterial injection of mercurochrome 220 and of methylene blue for septic conditions is not new; it was employed more than two years ago by GOINARD, MONDZAIN-LEMAIRE and PIETRI and by VALERIO, but the reviewer has seen no previous record of its use in leprosy.]

H. H. S.

MONTEL (R.), MONTEL (G.) & NGUYEN NGOC NHUAN. Essais de traitement de la lèpre par la phénol-sulfone-phthaléine. [**Trials of Phenol-Sulphone-Phthalein.**—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1064–1067.

This dye is given intravenously every two or three days in 5, 10 and 15 cc. doses of 0.006 gram per cc. up to a total of 185 cc. in 26 days in one patient and 173 cc. in 35 days in another. The urine remained free from albumen. The leprous lesions became stained of a red colour and improved rapidly, so although it is too early to report the ultimate results the method is considered to be worthy of further trial.

L. R.

MONTEL (R.), MONTEL (G.) & LE VAN PHUNG. Essais de traitement de la lèpre par la cystéine en injections intraveineuses. [**Trial of Cystein Intravenously.**—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1061–1063.

In this note the authors report on four cases of leprosy treated first by methylene blue with improvement in three, but when they ceased to progress he gave intravenous injections of 0.5 gram cystein three times a week up to 20 injections. The patient who had proved

resistant to methylene blue also failed to respond to cystein, but the other three showed considerable further improvement, so it is believed to be a useful adjuvant treatment. L. R.

COCHRANE (R. G.) & RAJ (M. Paul). **Alcohol Injections for the Relief of Nerve Pain in Leprosy.**—*Leprosy in India*. 1937. Jan. Vol. 9. No. 1. pp. 18-19.

This is a brief report on two cases of nerve leprosy in which 5 minims of 80 per cent. alcohol were injected into thickened ulnar nerves. In one with an oedematous nerve immediate relief of severe pain was obtained, with no recurrence up to six weeks. In the other only a few hours relief was afforded. It is important to avoid injecting the drug into the subcutaneous tissues as it is extremely painful. L. R.

TISSEUIL (J.). Essai de traitement de lèpres cutanées par le sérum sanguin de lèpres nerveuses. [**Nerve Leprosy Serum in Cutaneous Leprosy.**]—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 227-230.

In view of the frequency with which nerve cases of leprosy are free from cutaneous symptoms and the reverse, the author has tried separating the serum from blood taken from a pure stationary nerve case, heating it at 54-56°C. for an hour on three consecutive days, and injecting from 10 to 20 cc. subcutaneously at 3 to 7 day intervals up to a total of 170 cc. in five cutaneous cases of leprosy. No check on the evolution of the disease was noted, but only some amelioration of the general condition. L. R.

VAN BREUSEGHEM (R.). Essais thérapeutiques dans la lèpre. I. Le calcium. II. Le carbone intraveineux. [**Calcium Treatment.**]—*Ann. Soc. Belge de Méd. Trop.* 1936. Dec. 31. Vol. 16. No. 4. pp. 537-547.

I. Calcium chloride intravenously has been reported to have been of benefit in leprosy by KLINGMÜLLER and others. The author has therefore tried it, but without obtaining any amelioration of the condition of the patients in eleven maculo-nerve cases even when given with chaulmoogra oil preparations, but in some the lepra reactions were quickly extinguished.

II. He has also tried injecting intravenously 2 per cent. suspensions of animal charcoal with negative results. L. R.

ROTBERG (A.). Tratamento da reacção leprotica pelo carvão por via endovenosa. [**Treatment of the Leprotic Reaction by Charcoal Intravenously.**]—*Rev. Brasileira Leprologia*. S. Paulo. 1936. Vol. 4. Numero especial. pp. 163-173. [10 refs.] English summary.

This procedure has been recommended and the author has tried it in 25 patients and four of these a second time. Of the 25 three had

the nervous form, fourteen the mixed, five the maculo-anaesthetic and three the nodular. The charcoal was given in 50 μ particles suspended in 2 per cent. saline, 5 cc. being injected every other day, in the first series of 21 cases. Four remained unaffected, two were made worse, fifteen improved, but the amelioration was not maintained, relapses occurred in some soon after the treatment was stopped, in others actually while the treatment was being carried on. Rise of temperature, headaches and drowsiness were common. In a second series of eight, 4 of the former and 4 new, 5 μ particles were used in 2 per cent. suspension in 10 per cent. dextrose. Tolerance was better, but not the results; 4 were unchanged, 4 improved, 2 relapsed. The author concludes that the method has little to recommend it. H. H. S.

COLE (Howard Irving) & CARDOSO (Humberto). **Purification and Esterification of Chaulmoogra Oils.**—*Internat. Jl. Leprosy.* Manila. 1936. Oct.-Dec. Vol. 4. No. 4. pp. 455-468. With 2 figs.

This is a technical paper describing the apparatus and method of purifying chaulmoogra oils. The authors find that the time of esterification is not a reliable criterion for determining the completion of the reaction, but refractive index readings should always be used. The influence of sulphuric acid and other factors on the rate of esterification is described, and a method taking approximately eight hours, and the apparatus used, are described. Methods for the preparation of creosoted and iodized esters are given in detail, for which the original paper must be consulted by those interested. L. R.

PEREIRA (Loiola). On the Effects of Alepol on Leprosy.—Reprinted from *Antiseptic*. 1936. July. 3 pp.

SALIBA (Nagib). A physiotherapia no tratamento moderno da lepra, Cryotherapia. [**Cryotherapy in the Treatment of Leprosy.**]—*Brasil-Medico*. 1937. Feb. 13. Vol. 51. No. 7. pp. 281-286. With 8 figs. [26 refs.]

The value of carbolic acid snow in the treatment of leprosy is extolled as the best method, being easy to carry out and not violent in its action. Observations are made on eight patients and photographs reproduced to show the conditions of some of them. PALDROCK is quoted as saying that the snow modifies the leprosy in such a way that the body is rendered capable of eliminating it. The three chief agents in dermatological practice (not for leprosy only) are X-rays, radium and CO₂-snow. H. H. S.

LAGOUDAKY (Socrates). **Self-Inoculation of Leprosy—Second Communication.**—*Jl. Trop. Med. & Hyg.* 1937. Apr. 1. Vol. 40. No. 7. pp. 77-79.

In this paper the author records the effects of further treatment of his infection with fairly satisfactory results. He chose antilepra intravenously, an "ester-like" derivative of chaulmoogric acid, which was

also taken orally in tablet form. By the end of January 1935 he had received 69 tablets, 24 intravenous and 18 intramuscular injections, with remarkable results in causing some lepromata on his hands to clear up as well as macules. Further similar treatment, however, left a stationary condition, and the intramuscular injections became very painful. Later, further improvement occurred and various lesions disappeared by March 1936 after taking 658 tablets and having 25 intravenous injections until his veins became blocked, and 73 intramuscular ones. His general health remained good two years after his inoculation. His medical adviser recommends further intensive treatment.

L. R.

MALARIA.

HICKS (E. P.) & MAJID (S. Abdul). **A Study of the Epidemiology of Malaria in a Punjab District.**—*Records of the Malaria Survey of India*. 1937. Mar. Vol. 7. No. 1. pp. 1-46. With 11 charts (1 folding). [20 refs.]

The Karnal District in which these observations were made is in the Punjab plain, which has been subject in the past to fulminant epidemics of malaria. Six villages in this district have been kept under almost continuous observation for eight years. The main object of the investigation was the measurement of the factors, infection and immunity, in an area subject to epidemic malaria.

The average enlarged spleen was found to be the best measurement of immunity, its size increasing steadily and consistently in those children who are more immune; it is, moreover, but little affected by changes in the dose of infection from season to season and from year to year. The measurement of the dose of infection is the product of the crescent rate and the mean catch of *A. culicifacies*. This, unfortunately, does not give full weight to the influence of climate on the longevity of the mosquito. The fluctuations in the dose of infection are sufficient to explain fluctuations in the incidence of malaria. There was little evidence of fluctuations in the immunity of the population in the period under review. When the level of infection is raised for a single year the increase in immunity is small. The authors conclude that fluctuations in malaria in Karnal are almost entirely due to fluctuations in the dose of infection which is determined, chiefly, by the length of the period of low saturation deficiency. This period depends more on an even distribution of rain than on the total rainfall. This résumé does but scant justice to a paper that should be consulted in the original by those interested.

Norman White.

FIELD (J. W.). **A Case of Severe Subtertian Malaria with Recovery.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 565-568. With 2 coloured figs. on 1 plate.

In view of the paucity of published information regarding the highest degree of infestation with malaria parasites compatible with life, considerable interest attaches to the case of subtertian malaria described in this note. The patient, a male Tamil aged 30, was being treated with intramuscular injections of atebirin musonate. On the fourth day thin blood films were examined and gave the following results: Red blood cells counted, 5,000; parasites 896; infected cells 797; single infection of cells 682; double infection of cells 93; triple infection of cells 8; quadruple infection of cell 1. There were large numbers of segmenting parasites. The total parasite count was in the neighbourhood of 660,000 per cmm. The patient recovered.

N. W.

FIELD (J. W.) & NIVEN (J. C.). **A Note on Prognosis in Relation to Parasite Counts in Acute Subtertian Malaria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 569-574.

This is an interesting attempt on the part of the Malaria Research Division of the Institute for Medical Research, Federated Malay

States, to give statistical precision to the belief that prognosis in acute subtertian malaria bears some relationship to the number of parasites in the peripheral blood. A study was made of 750 cases on admission to hospital, none of whom had had recent malaria treatment. Most of the cases were adult males, Chinese, Indian or Malay. The following table, produced from the report, gives details of the parasite counts :—

Death Rate in Relation to the Parasite Count on the First Day of Treatment in 750 Cases of Acute Subtertian Malaria.

	Trophozoite Counts per cmm. of Blood on 1st Day of Treatment.					
	Under 5,000	5,000 to 25,000	25,000 to 100,000	100,000 to 250,000	250,000 to 500,000	Over 500,000
Cases	209	261	205	57	10	8
Deaths	1	0	1	4	2	5
Death rate per cent. ...	0.5	0	0.5	7	20	63

There were only two deaths among 675 cases with counts of less than 100,000 per cmm. Among 75 cases with counts above 100,000 there were eleven deaths. Counts made after the administration of malaria drugs are a less reliable indication of severity, though providing useful information of progress. The extreme limit of tolerance of Asiatic adults for the local strains of *P. falciparum* is probably in the region of 750,000 parasites per cmm. of peripheral blood. N. W.

FRIEDMANN (J.). Zur Frage der Beziehungen zwischen Epilepsie und Malaria. [Relationship between Epilepsy and Malaria.]—*Wien. Klin. Woch.* 1937. Apr. 30. Vol. 50. No. 17. pp. 565–567. [26 refs.]

This paper is written in honour of the 80th birthday of WAGNER-JAUREGG.

A case is described of a person who went through the war from 1914 to 1918. After the war he went to Albania as an electrical engineer from 1920 to 1928. There he had "heat stroke," and fell and injured his head. He was unconscious for half an hour. Shortly after he had an attack of fever and malignant tertian parasites were found in the blood. He had relapses in spite of treatment by quinine. About this time he had epileptic seizures. He stated the seizures were of two kinds; severe, lasting $1\frac{1}{2}$ to 3 hours, there was no warning, the tongue was bitten; slighter, which lasted a very short time and were announced by a feeling of faintness, discomfort and shivering. His doctor stated that the attacks of epilepsy were connected with the malarial attacks. The author thinks that the "heat stroke" in Albania may have been cerebral malaria. He discusses the *pros* and *cons* of malarial encephalitis being responsible for the epileptic attacks. He concludes by saying that of all diseases epilepsy has the most features in common with malaria. As is well known in malaria there is a definite periodicity,

in epilepsy there is an unrecognized rhythm, the cause of which is completely unknown. As regards the treatment of developed cases of epilepsy by malaria-therapy further study of certain kinds of cases is required.

E. D. W. Greig.

PIERI (J.), BOUET, FLORI & AUBANEL. Leucémie lymphoïde et paludisme. [**Leukaemia and Malaria.**—*Marseille-Méd.* 1936. Dec. 25. Vol. 73. No. 36. pp. 719-723.]

This is a description of a case of leukaemia in a man aged 57 who had suffered from chronic malaria. There was a fairly general glandular enlargement. The red blood cells numbered 4,600,000 and the white cells 590,000, an unusually high leucocytosis. Of the white cells no less than 96 per cent. were mononuclear, the remaining 4 per cent. being polynuclears. No large mononuclears were noted. He was submitted to radio-therapy with benefit to his general condition. On his discharge from hospital red cells numbered 5,420,000, white cells 4,000, of which 74 per cent. were mononuclears. The author raises the question as to whether the frequently repeated attacks of malaria from which the patient suffered during twenty years may not have been the cause of this form of leukaemia [designated by the author, Touraine's Splenocytoleukaemia, differing from the ordinary lymphocytic leukaemia].

N. W.

RDUCH (Hugo). Beitrag zur Frage der Kriegsmalaria. Ein Fall von febris Bang. [**War Malaria. A Case of Undulant Fever (Abortus Type).**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Apr. Vol. 41. No. 4. pp. 379-380. With 1 fig. [Summary appears also in *Bulletin of Hygiene.*]

Patient had suffered from malaria from 1908-1911 and from 1916-1918. In 1918 he had blackwater fever in Palestine. In 1934 he had attacks of fever. To November 1935 he was treated for malaria; then he came under the care of the author. No parasites were found in his blood and the spleen was not enlarged. However, he was given a course of atabrin and plasmoquine, but without effect on the fever. Then the blood was tested for agglutination with the Bang's bacillus and was found to agglutinate the latter up to 1 : 2,000. He was then treated with a Bang vaccine (Behring) and made a good recovery. This then was an example of a fever erroneously attributed to "war malaria" and treated as such.

E. D. W. Greig.

JERACE (Felice). La splenomegalia malarica nei bambini curata con il metodo di Maurizio Ascoli. (Nota preventiva.) [**Splenomegaly in Malaria treated by Ascoli's Method.**—*Policlinico.* Sez. Prat. 1936. Aug. 31. Vol. 43. No. 35. pp. 1562, 1565.]

ASCOLI in 1930 advocated the treatment of splenomegaly in chronic malaria by the intravenous injection of a solution of adrenalin in small doses of from 1/100 to 1/10 mgm. Very successful results have been reported, to confirm which the author treated three children, aged 4, 6 and 9 years respectively, from the Agro Romano, all of whom were suffering from chronic malaria, having been infected and reinfected since infancy. The initial doses were 1/100 mgm. in one

case and 1/200 mgm. in the others. After 15 injections, the final dose being 1/20 mgm., a reduction of $6\frac{1}{2}$ cm. in the size of the spleen was noted in one case and of 4 cm. in another. In the case of a malignant tertian infection a febrile attack occurred on the third day of treatment, with parasites in the peripheral blood, probably the result of treatment; a three days' treatment with quinine 0.60 gm. a day was interposed. The results of treatment were uniformly satisfactory; there was no sign of intolerance and the children were able to follow their normal occupations during treatment. Not only was there a rapid reduction in the volume of the spleen but also a noteworthy improvement in the blood, the leucocyte formula returning to normal.

N. W.

DE NEGRI (Ugo). Cura della splenomegalia malarica secondo Maurizio Ascoli. Ia nota. [**Treatment of Splenomegaly by Ascoli's Method.**]—*Policlinico*. Sez. Prat. 1936. Nov. 30. Vol. 43. No. 48. pp. 2158–2159.

This is a record of seven patients, ages varying from 15 to 50, suffering from chronic malaria with very large spleens, and treated by the intravenous injection of adrenalin. Injections were given once a day, starting with a dose of 1/100 mgm. which was increased gradually to 1/10 mgm., the maximum dose. The treatment was continued for from 30 to 40 days. The results were good; in all cases there was a marked reduction in the size of the spleen.

N. W.

ASCOLI (M.), MISSIROLI (A.), BONFIGLI (A.), CASU (A.), DILIBERTO (U.), MUSUMECI (N.), RIOLO (P.), ROCCA & TERENCE. Relazione su di un esperimento compiuto nell' Agro Pontino sulla cura di Maurizio Ascoli nella infezione malarica. [**Ascoli's Treatment of Malarial Infections.**]—*Policlinico*. Sez. Prat. 1937. Apr. 5. Vol. 44. No. 14. pp. 559–62, 665–6, 669–70. With 16 figs.

CANOVA (Francesco). Trattamento della splenomegalia malarica. [**Treatment of Malarial Splenomegaly.**]—*Ibid.* pp. 670–672. [12 refs.]

The report of Ascoli and his colleagues gives full clinical details of 17 men, 17 women and 6 children, all suffering from chronic malaria with enlargement of the spleen, who were treated by Ascoli's method of intravenous injections of adrenalin. No ill effects from the treatment are reported. The results were very satisfactory. Rapid improvement of the patients' condition, cessation of splenic pain, noteworthy improvement of the blood, reduction more or less marked in the size of the spleen, increase in weight and restitution of the capacity to work were marked results of the treatment.

Canova reports the results of treatment, in Transjordan, of 19 cases of chronic malaria by Ascoli's method. The usual doses of adrenalin were used, from 1/100 to 1/10 mgm. The author speaks highly of the value of the method. He further treated 24 cases of acute malaria with adrenalin in association with quinine. Adrenalin is said to counteract the depressive action of quinine, to stimulate the circulation and to lessen the risk of relapse by liberating parasites that have taken refuge in the spleen.

N. W.

CANOVA (Francesco). Associazione chinino-adrenalinica nel trattamento della malaria acuta.—*Riv. di Malariologia*. Sez. I. 1937. Vol. 16. No. 1. pp. 31–33. English summary (8 lines).

ASCOLI (M.). Tatsachen und Fragestellungen meiner neuen Malaria-therapie. [**Facts and Problems of my New Malaria Therapy.**]—*Muench. Med. Woch.* 1937. Mar. 5. Vol. 84. No. 10. pp. 370–371. With 2 figs. [27 refs.]

The author's treatment consists in the intravenous injection of adrenalin, the scheme of dosage recommended is as follows: begin with 1/100 mgm., give daily increasing doses, 1/90, 1/80 up to 1/10 mgm. The last dose is repeated daily for 20 days. In cases of marked malarial splenomegaly it may be advisable to increase the dose provided the drug is well tolerated. CICCHITTO, who treated 135 cases of malaria in Italian East Africa, recorded that adrenalin administration reduced considerably the period of treatment of acute cases of malaria and also the quantity of quinine required for a cure. As regards the effect on relapses after treatment his pupil, RIOLO, noted that in 15 out of 18 cases of chronic malaria treated two years previously, and a further 20 cases treated one year previously the reduction in the size of the spleen was maintained and there was no relapse. He considers that adrenalin by reducing the congested portions of the enlarged spleen destroys the breeding ground of the malaria parasite.
E. D. W. Greig.

MANGIACAPRA (Armando). L'opoterapia splenica nella malaria. [**Treatment of Malaria with Spleen Extract.**]—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 6. pp. 428–440. [12 refs.]

A summary of the conclusions at which the author has arrived regarding the value of spleen extract in the treatment of malaria. During six years no less than 610 cases have been so treated. Spleen extract has no direct action on the malaria parasite and none on the fever. It has therefore no therapeutic value in acute malaria or in the early stages of chronic malaria. In older chronic infections it can be used with marked benefit. It increases organic immunity, stimulates the reticulo-endothelial system and phagocytosis, improves the blood condition and general nutrition, and effects a marked reduction in the size of the spleen. It is thus a valuable adjuvant in the treatment of chronic malaria. It has, moreover, a slight power of reactivating latent infections.
N. W.

FARINAUD (J.). La prophylaxie du paludisme par les médicaments synthétiques en Indochine, ses conditions et ses possibilités. (Note préliminaire.) [**Synthetic Drugs in the Prevention of Malaria.**]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1085–1090.

In spite of the admitted efficacy of the synthetic remedies in controlling malaria incidence, their prophylactic use is of limited applicability in Indo-China, where malaria can be considered as hyper-endemic for not less than nine months of the year.
N. W.

CLARK (H. C.) & KOMP (W. H. W.). **A Sixth Year's Report on Malaria in Panama (Chagres Valley) with Reference to Drug Control.**—*Amer. Jl. Trop. Med.* 1937. Jan. Vol. 17. No. 1. pp. 59-77.

Previous reports by the authors on drug control of malaria in Panama have been noted in this *Bulletin* (1936, Vol. 33, p. 835; 1935, Vol. 32, pp. 434, 784). The object of the study is to find a suitable compromise in malaria control that can be used by business organizations in the tropics to increase labour efficiency in places where satisfactory antimosquito measures are not possible. The year under report was a period of low malaria incidence following the epidemic period of 1935, thus corroborating the authors' views regarding the cyclic nature of malaria incidence in Panama. As before, monthly blood-parasite surveys in three groups of villages were carried out. In one group blood-positives were treated under supervision with atebryn-plasmoquine; in the second group blood-positives were treated under supervision with quinine-plasmoquine. In the third control group blood-positives received quinine if they desired it; there was no supervision. The average monthly parasite rates in the three groups were 9.1, 12.3 and 18.5 per cent. respectively. Of those examined in every one of the twelve monthly surveys, 59.9 per cent. had parasites in their blood at some period of the year. A high parasite rate can exist at all ages of a relatively tolerant population. Adequate treatment lowers the parasite rate during an inter-epidemic period. Relapses, especially during a year of low incidence, are responsible for a great part of the malaria observed. Infected adults, even though relatively tolerant to malaria infection, will not be able to support the strain of daily hard labour without medical attention. Non-medical personnel in the field, to give immediate antimalaria treatment to those who become clinically ill, supervised by a qualified physician making weekly visits of inspection, should suffice.

N. W.

ROBIN (L. A.). **Conceptions ancienne et moderne du traitement et de la prophylaxie chimique du paludisme. (Application à l'élément militaire dans les zones endémiques.)** [**Old and New Conceptions of the Curative and Prophylactic Drug Treatment of Malaria, with Special Reference to the Protection of Troops in Endemic Areas.**].—*Rev. Service Santé Milit.* 1937. Feb. Vol. 106. No. 2. pp. 151-176. [22 refs.]

A well-written and interesting account of the changed outlook on drug therapy and prophylaxis of malaria that has evolved during the last twenty years. Though there is nothing new or revolutionary in the author's ideas his well controlled observations on the relative value of quinine and the synthetic drugs in labour forces in south Indo-China are of interest. In hyperendemic areas prophylactic quinine rigorously administered is often insufficient to maintain the efficiency of a military force. If the force is mobile, however, and camp can be moved every three weeks and pitched not nearer than two thousand metres from native villages and at a distance from frequented roads and paths, the prophylactic administration of drugs can maintain the efficiency of the force even in hyperendemic areas.

N. W.

JOLLY (A.) & SICAULT. Nouveaux cas d'évolution complète du *Plasmodium praecox* dans le sang circulant. [**Complete Development of *P. praecox* in the Circulating Blood.**—*Bull. Soc. Path. Exot.* 1936. Apr. 1. Vol. 29. No. 4. pp. 389-390.

In three cases of malignant tertian malaria from Morocco the blood films showed all stages of development of the parasites up to mature schizonts and crescents. The proportions of the various stages were not the same in the three cases. C. M. Wenyon.

LOURIE (E. M.) **Studies on Chemotherapy in Bird Malaria. IV.—Failure to promote Drug-Resistance in *Plasmodium cathemerium* by Prolonged Administration of Quinine or Plasmochin.**—*Ann. Trop. Med. & Parasit.* 1935. Dec. 18. Vol. 29. No. 4. pp. 421-433.

An attempt was made to produce drug-resistant strains of bird malarial parasites (*P. cathemerium*) by administering to infected birds in series daily doses of quinine hydrochloride or plasmoquine. At no time in the series of bird passages did it appear that the virulence of the parasites was affected or that they were acquiring drug resistance. The claim of previous workers to have produced such strains is critically examined, the conclusion being reached that the evidence they have advanced is inconclusive. C. M. W.

HUFF (Clay G.) & BLOOM (William). **A Malarial Parasite infecting all Blood and Blood-forming Cells of Birds.**—*Jl. Infect. Dis.* 1935. Nov.-Dec. Vol. 57. No. 3. pp. 315-336. With 2 coloured plates, 2 figs. & 3 charts. [34 refs.]

A study of the bird malarial parasite *Plasmodium elongatum* in experimentally infected canaries has shown that it has a 24-hour cycle, with a peak of segmentation between 8 and 10 o'clock in the morning. The most interesting feature of the parasite is that it is capable of living and developing in all blood and blood-forming cells of the canary, including the granular leucocytes. The vast majority of the parasites, however, occur in the cells of the erythrocyte series, while the gametocytes are found only in the normoblasts and erythrocytes. Those schizonts which occur in cells devoid of haemoglobin do not form pigment, which is present only in those growing in cells with obvious haemoglobin. Another peculiar feature is the shape of the merozoites, which are elongate and arranged like those of coccidia. The paper, which has two excellent coloured plates, describes the various types of cell in the bone marrow and spleen which are liable to contain parasites and their relationship to one another.

C. M. W.

BRUMPT (Émile). Réceptivité de divers oiseaux domestiques et sauvages au parasite (*Plasmodium gallinaceum*) du paludisme de la poule domestique. Transmission de cet hématozoaire par le moustique *Stegomyia fasciata*. [**Susceptibility of Various Tame and Wild Birds to *Plasmodium gallinaceum*. Transmission by *Stegomyia fasciata*.**—*C. R. Acad. Sci.* 1936. Oct. 19. Vol. 203. No. 16. pp. 750-752.

Working with a strain of *Plasmodium gallinaceum* imported from Ceylon the author has successfully maintained the strain by sub-

inoculation. He has shown that it is possible to infect the goose, pheasant, partridge and peacock but not the duck, guinea fowl, pigeon, quail, buzzard, canary, sparrow, calfat and chaffinch. In fowls a heavy infection, not infrequently fatal, follows inoculation. Development of the parasite does not take place in *Culex fatigans*, whereas in *Stegomyia fasciata* it occurs with the greatest ease, all mosquitoes exposed having become infected. In one on the eighth day 1,650 oöcysts were counted on the stomach. The author's opinion is that the fowl is not the natural host of the parasite, which in these birds is very limited in its distribution. C. M. W.

TALIAFERRO (William H.) & CANNON (Paul R.). The Cellular Reactions during Primary Infections and Superinfections of *Plasmodium brasilianum* in Panamanian Monkeys.—*Jl. Infect. Dis.* 1936. July-Aug. Vol. 59. No. 1. pp. 72-125. With 13 plates. [29 refs.]

This paper gives the results of an exhaustive investigation into monkey malaria from the point of view of the mechanism of natural and acquired immunity. The parasite, *Plasmodium brasilianum*, used in this study is of the quartan type in which the schizogony cycle is completed in 72 hours. The infections in various monkeys of Panama were produced as a rule by the intravenous inoculation of several cc. of heavily infected blood. Parasites could be detected by the examination of thin blood films immediately after the inoculation, and the infection thus produced progressed steadily from this point till a crisis occurred. At the crisis the number of parasites in the blood decreased rapidly till a condition of low grade blood infection was reached. This passed into a latent phase during which parasites could be detected in the blood only during the spontaneous relapses of greater or less intensity. The blood and organs of some hundreds of monkeys thus infected were examined, parasite counts were made both in blood and agar smears, while frequently portions of spleen were removed during life with a view to observing in the individual animal the changes which were taking place during the course of an infection. The whole study has been most carefully carried out and confirms the conclusions reached from the previous studies on immunity in bird malaria. The paper, which is illustrated by a number of excellent plates depicting the cellular reactions and tissue changes, is one of the most important which have appeared on the subject of immunity in malaria. It contains so much detail that it will be possible to give here but a brief outline of its main contents.

It has been determined that throughout an infection in any individual monkey the rate of reproduction of the parasite is fairly constant, save for a slight retardation of the cycle at the time of the crisis from the normal three-day period to four days. This being the case, it follows that the variations in the number of parasites in the blood at different stages of the infection are due not to alterations in the rate of reproduction but to varying degrees of parasite destruction which involves both the free merozoites and the intra-corporal stages of the parasite. It may be accepted that of the 8 to 12 merozoites produced at schizogony only 3 succeed in entering the blood corpuscles and of these 3 only about half on an average survive. This means that in the most acute infections the net increase of parasites at every sporulation before the crisis is only about 50 per

cent. During and after the crisis, except during the temporary relapses, the rate of destruction of parasites is much greater than this.

The most important organs showing definite cellular reactions are the spleen, liver and bone marrow, and these reactions are of two kinds: firstly the phagocytosis of parasites by differentiated macrophages and secondly lymphoid hyperplasia which appears to build a mesenchymal reserve from which further macrophages are evolved. During the acute rise of the infection, counts have shown that parasites were relatively more numerous in the peripheral blood than in the blood of the internal organs. The spleen has always shown the highest concentration, there being approximately 20 times as many parasites for any number of red blood corpuscles as in the peripheral blood. The liver and lungs gave a ratio of about one-third of this while the remaining organs, including the bone marrow, rarely showed a concentration greater than three times that of the peripheral blood. It is noteworthy that the spleen, which showed the highest concentration during the developing infection, was the organ in which the most intense phagocytosis occurred at the crisis. It has to be remembered that phagocytosis occurs to some extent during the development of the infection and involves infected as well as uninfected red blood corpuscles. This erythrophagocytosis, quite apart from the destruction of red blood corpuscles by the parasites, is probably an important factor in causing the anaemia of malaria. At the crisis the phagocytosis of infected cells is suddenly increased and is to be looked upon as an acquired immunity response in contrast to the phagocytosis which has gone on before the crisis and which is due to a natural immunity. In the spleen during the early developing infection, infected red blood corpuscles pass into the Billroth cords and thence into venous sinuses. As the infection proceeds the infected cells are held up to an increasing extent in the Billroth cords till when the crisis is approached the infected cells no longer pass on into the sinuses. They appear to be held in the cords by some affinity for the macrophages. There then follows, sometimes quite suddenly, an active phagocytosis on the part of the macrophages in the Billroth cords of the detained corpuscles. A similar phagocytosis occurs also in the liver and bone marrow, but it was not possible to determine in these organs whether or not there occurred at the crisis a regional distribution of parasites comparable with that seen in the spleen just prior to the initiation of active phagocytosis. The phagocytosis in the liver and bone marrow, when compared with that in the spleen, is of little importance from the point of view of immunity except after splenectomy, long continued infection or failure of the spleen to respond to an infection. The intense phagocytosis at the crisis reduces the infection to a low level, in spite of the fact that the parasites continue to reproduce at their original rate.

The pigment accumulating in the macrophages at the crisis is at first in the form of fine granules, but these soon show a tendency to coalesce into larger masses which appear to occur in a smaller number of macrophages. It seems that the pigment finally disappears a few months after a malarial attack. If a relapse occurs fresh granules appear in the macrophages and these pass through the same phases as those deposited at the first attack. The macrophages of organs other than the spleen, liver and bone marrow play hardly any part in the defence against malaria. With the development of macrophage activity lymphoid and myeloid hyperplasia occurs. Lymphoid

hyperplasia is first detected in the spleen and then, in the case of severe and prolonged infections, it extends to the liver, bone marrow and possibly the kidneys. Myeloid hyperplasia is represented by erythropoiesis. Lymphorrhexis also is always associated with severe malaria. When it is extensive the reticular cells of the spleen follicles are transformed into macrophages and become distended with lymphocytic fragments. This lymphorrhexis appears to stimulate lymphoid hyperplasia. Primarily there is an enlargement of the lymphoid follicles in the spleen due to increase in the medium lymphocytes and to a less extent of the reticular cells and large lymphocytes. The small lymphocytes progressively disappear from the follicles, one of the most striking results of the infection. With continued malarial stimulation the red pulp becomes infiltrated with basophilic cells (plasma cells or lymphocytic cells). In the follicles and in the red pulp there can be seen every gradation between lymphocyte and macrophage, an indication of the active production of phagocytes. The disappearance from the follicles of the small lymphocytes is due partly to their migration into the pulp of the spleen or their transformation into medium lymphocytes which increase by mitosis, migrate and hypertrophy into monocytoïd cells and macrophages. Associated with the active development of the lymphoid follicles themselves there appear in the red pulp of the spleen basophilic cells collected into irregular islands and scattered evenly throughout the pulp. These cells are either all plasma cells, originating for the most part from small lymphocytes but also from medium and large lymphocytes, or all lymphocytes of the small, medium and large types, the medium being the most numerous. These two types of basophilia are designated the plasma cell type and the lymphocytic type. The significance of the first type is not understood, as the function of the plasma cell is not known. Apart from this the entire process in the spleen seems to be directed to the formation of lymphocytes and reticular cells which can be transformed into macrophages. These changes, as is to be expected, bring about varying degrees of splenomegaly.

In the bone marrow it is impossible to distinguish between the early stages of erythropoiesis, myelopoiesis and lymphopoiesis, but frequently a hyperplastic bone marrow will exhibit a great increase in one of these processes without any appreciable change in the other two. Owing to the difficulty of distinguishing lymphocytes from other stem cells of various blood elements a diffuse lymphopoiesis cannot be recognized. On the other hand there sometimes occurs a formation of large lymphatic follicles containing pronounced secondary nodules with many mitotic figures. This lymphoid hyperplasia occurred in only a few animals and was associated with similar accumulations in the cortex of the kidney and the lung. In the liver, when malarial stimulation has been marked, increase in the periportal tissue, or mantling, as it is termed, is found. This increase is due chiefly to medium lymphocytes. This mantling, however, is of rare occurrence, so that hepatomegaly must be attributed to cloudy swelling and increase in size of Kupffer cells resulting from phagocytic activity.

Certain experiments were carried out to test the behaviour of the tissues towards superinfections by injecting large quantities of washed infected red blood corpuscles during the latent phase. Generally the changes which occur are similar to those of the primary infection,

but they are instituted immediately so that the injected parasites are removed rapidly from the circulation by active phagocytosis.

The reason why the spleen, liver and bone marrow are the organs chiefly concerned with the protection against malaria is that in them there is direct contact between blood and macrophages and a slow circulation, but the reason for the increased phagocytosis associated with acquired immunity is not so easily explained. The most simple explanation would be the action of some opsonizing antibody, but there is little evidence that such an antibody exists. There is, however, an increase in the number of macrophages which from the evidence available have arisen, as noted above, by transformation of lymphocytes, which themselves increase greatly in number as a result of the lymphoid hyperplasia which occurs in the spleen and other organs under the influence of continued infection. As regards the replacement of erythrocytes this is limited to an increased erythropoiesis in the bone marrow.

It thus appears that immunity in monkey malaria depends on the rate at which the macrophages can phagocytize the infected red blood corpuscles. In natural immunity the rate of destruction of parasites is in most cases insufficient to prevent the development of the infection, but with the advent of the crisis and acquired immunity the capacity of the macrophages, now greatly increased in number as a result of lymphoid hyperplasia, to destroy parasites is increased to such an extent that the infection is checked and reduced to a low level. This property of rapidly destroying parasites, except during temporary relapses, is retained as an acquired immunity for some considerable time.

C. M. W.

JASWANT SINGH & HARBHAGWAN. **Failure to produce Infection in Two Species of the Lower Oriental Monkeys by the Injection of Malarial Sporozoites from Naturally Infected Anophelines.**—*Records of the Malaria Survey of India*. 1935. Dec. Vol. 5. No. 4. pp. 495-497.

Large numbers of actively motile sporozoites from the salivary glands of naturally infected *Anopheles* were inoculated in Ringer's solution into two monkeys (*Silenus irus* and *S. rhesus*) both by the intravenous and the subcutaneous routes. The animals were examined daily for two months without showing any evidence of infection. It is presumed with good reason that the sporozoites were those of human malaria.

C. M. W.

RODHAIN (J.). La réceptivité des singes africains au *Plasmodium knowlesi*. [The Susceptibility of African Monkeys to *Plasmodium knowlesi*.]—*C. R. Soc. Biol.* 1936. Vol. 123. No. 34. pp. 1003-1006.

The experiments described were designed to determine the pathogenicity of *Plasmodium knowlesi* for African monkeys. They were carried out on three *Cercopithecus cephus*, one *Cercopithecus griseo viridis*, two *Cercocebus fuliginosus lunulatus* and four *Papio jubilaens*. An Indian strain of *Pl. knowlesi* was used. Before the experiment all the monkeys were submitted to a course of treatment with atebrian and plasmoquine to avoid the possibility of the results being complicated by the appearance of some latent natural *Plasmodium*

infection. The animals were infected by subcutaneous or intramuscular injections of blood rich in *Pl. knowlesi*.

All the four species of monkeys were found to be susceptible to infection. In *Cercopithecus griseo viridis* and in *Papio jubilaus* the infection develops in an acute manner, with a massive invasion of red cells, ending in death with symptoms of haemoglobinuria. In *Cercopithecus cephus* infection is milder and develops in a chronic manner. By judicious drug treatment it is possible to change an acute infection of *Papio jubilaus* into a chronic one. The author considers this species of monkey to be a better reservoir of virus than is *Macacus rhesus*. The appearance of sexual forms of *Plasmodium kochi* in one *Papio jubilaus* infected with *Plasmodium knowlesi* shows that there is no cross immunity between these two parasites. N. W.

MOSNA (Ezio). L'azione della chinina e dell'atebrin sul *Plasmodium knowlesi*. [Action of Quinine and Atebrin on *P. knowlesi*.]—*Riv. di Malariologia*. Sez. I. 1936. Vol. 15. No. 2. pp. 99–105. With 30 figs. on 1 plate. English summary (8 lines).

In comparing the action of quinine with that of atebrin on *Plasmodium knowlesi* in the monkey the author finds that a single dose of atebrin has a more decided action on the morphology of the parasite, its rate of growth and its disappearance from the blood than has a single dose of quinine, which, however, has similar but less marked effects. C. M. W.

CHOPRA (R. N.), DAS GUPTA (B. M.) & ROY (A. C.). On the Mode of Action of Atebrin on *Plasmodium knowlesi*—a Preliminary Note.—*Indian Med. Gaz.* 1936. Dec. Vol. 71. No. 12. pp. 710–712.

Half a cubic centimetre of defibrinated blood from a monkey heavily infected with *P. knowlesi* (680,000 parasites per cmm.) was mixed with 0.5 c.c. of atebrin solution, 1 in 25,000 of sterile physiological salt solution, and the mixture, after 24 hours' incubation, was inoculated subcutaneously into each of two *Silenus rhesus* monkeys. As a control, two monkeys of the same species were similarly inoculated with the same quantities of defibrinated blood mixed with normal salt solution. Both control monkeys showed very heavy infections which proved fatal. Both monkeys inoculated with blood that had been mixed with the atebrin solution remained well. No parasites were at any time found in their blood and cultural and inoculation experiments gave no evidence of infection. The action of atebrin on malaria parasites would thus appear to be a direct one. N. W.

RUGE (H.). Neuzeitliche Probleme der Malariaforschung. [Recent Problems in Malaria Research.]—*Deut. Med. Woch.* 1936. Nov. 13. Vol. 62. No. 46. pp. 1869–1872.

The author again deals with JAMES's investigations on malaria which were discussed in a previous paper (this *Bulletin*, 1937, Vol. 34, p. 153).

In regard to malaria prophylaxis he considers that atebrin is a distinct advance on quinine. For successful prophylaxis the former need be given only twice weekly in doses of 0.01 gm., in badly infected areas it may be combined with 0.01 gm. plasmoquine twice weekly. It is not yet definitely determined that these two drugs are causal

prophylactics. The prophylactic treatment should be begun one week before entering the malarial area in order that the drug may reach a certain level in the blood, which prevents the sporozoites from entering the reticulo-endothelial system.

E. D. W. Greig.

CHOPRA (R. N.) & ROY (A. C.). **On the Determination of Small Quantities of Atebrin in the Blood.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 487-488.

"Accurately measured amounts of oxalated blood (about 2 c.c.) were allowed to soak into the strips of filter-paper contained in the inner tube of Vedder and Masen's (1931) apparatus as modified by Chopra, Roy and Das Gupta (1934). It was then put inside a desiccator containing sulphuric acid overnight. The next day the dry paper-strips were reshuffled by means of a clean platinum loop and the tube was inserted into the outer jacket. Ether was poured through the top of the inner tube, so that after filling it up, it was allowed to overflow and fill nearly half the bulb portion of the outer tube. This was then connected to a reflux condenser through which cold water was allowed to circulate and it was immersed in a hot water-bath up to the level of the ether contained in the outer tube. After the extraction had been allowed to proceed for two hours, the inner tube was removed and the ether extract contained in the outer tube was heated to drive away the ether. The extracted atebrin was dissolved in 4 c.c. of N/10HCl by heating in a boiling water-bath. It was observed that though ether sometimes extracted a yellow pigment even from blood containing no atebrin, this yellow colouring matter was not dissolved in N/10HCl. The acid extract was then cooled in ice and filtered through a small Whatman filter-paper. Three c.c. of the filtrate were then accurately measured into one of a set of small test-tubes of uniform bore and all made of the same kind of colourless glass-tubing and to the others varying amounts of the standard atebrin hydrochloride solution in N/10HCl were added. The standard atebrin solution used contained 0.01 mg. of atebrin hydrochloride per 1 c.c. of the solution. The total volume in each tube was made up to 3 c.c. by the addition of varying amounts of M/10HCl. 0.1 c.c. of 20 per cent. caustic soda solution was next added to each tube followed by 0.5 c.c. of amyl alcohol and then thoroughly mixed. The test-tubes were left for some time on the table to allow the amyl alcohol layer to separate completely. The yellow colour of the solutions was completely taken up by the layer of amyl alcohol. The colour of the amyl alcohol layer in the unknown was compared with that in the standards against a white background, the tubes being looked through sidewise."

N. W.

WHITE (R. Senior). **On Malaria Transmission in the Jeypore Hills. Part I. A Year's Dissection Results.**—*Records of the Malaria Survey of India.* 1937. Mar. Vol. 7. No. 1. pp. 47-75. With 1 fig. [18 refs.]

The Jeypore Hills, part of the Eastern Ghats, running parallel to the northern part of the Bay of Bengal, at a distance of from 30 to 100 miles from the coast, and inhabited by aboriginal tribes, have always had an unenviable reputation for malaria. The Raipur-Vizianagram Railway was constructed through this country between 1925 and 1931 and the author of this paper was in charge of the anti-malaria measures involved. Protection work has continued uninterruptedly and a large mass of data regarding Anophelines has accumulated. At the 1,000 feet level, 6,944 dissections of twelve species of Anophelines have been made, *culicifacies*, *fluviatilis*, *varuna*,

minimus, *aconitus*, *jeyporiensis*, *splendidus*, *maculatus*, *theobaldi*, *jamesi*, *pallidus*, and *annularis*. The six first named species were alone found infected and of these only *fluviatilis*, *varuna* and *minimus* were infective, that is, showed gland infections. Only these three species appear to be concerned in the transmission of malaria in this region. There being no differences in their respective breeding places, and their infected and infective rates being almost identical, they can, for practical purposes, be treated as one, the *funestus* group. The most interesting and important fact that emerges from this interesting paper is that *culicifacies* plays no part in the local transmission of malaria, though it dominates the Anopheline fauna. Only three infected guts were found among 4,744 *culicifacies* dissected. The explanation of this local lack of pathogenic importance of *culicifacies* has not yet been elucidated. Cattle sheds have a special attraction as a resting place, and zoophilism may be the clue. As a second possible explanation the author suggests that *culicifacies*, like *maculipennis* in Europe, may be a mixture of sub-species. N. W.

SYMES (C. B.). *Anopheles funestus* (Giles) as a 'Domestic' Breeder.—*Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 361-364.

In Malindi, a small town of 750 dwellings on the coast of Kenya, 80 miles north of Mombasa, *A. funestus* has been found breeding in wells. Most of the wells are from 15 to 30 feet deep and contain a foot or two of brackish water. Larvae have also been found repeatedly in domestic water containers of many kinds; many of these larvae are brought in with the daily supply of water from the wells, but in houses with large tanks it is probable that continuous breeding goes on in the house. N. W.

EVANS (A. M.) & GARNHAM (P. C. C.). *The Funestus Series of Anopheles at Kisumu and a Coastal Locality in Kenya*.—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 511-520. With 1 text fig. & 3 figs. on 1 plate.

Anopheles funestus, Giles, one of the widely distributed African malaria vectors, has long been regarded as a very variable species. In 1930, LEESON recorded from Southern Rhodesia ten distinct forms of wing pattern (*Bull. Entom. Res.*, Vol. 21, pp. 421-428). Since then, by examination of developmental stages and certain internal characters of females, it has been established that mosquitoes formerly included under this name are not one species, but several. The group has become known as the *funestus* series of *Anopheles*. One Anopheline, described and named by LEESON as *A. funestus* var. *rivulorum* (this *Bulletin*, 1935, Vol. 32, p. 804) has in this paper been raised to specific rank, and the authors describe all stages of two forms found in Kenya. The larvae of one form were taken among beds of water lettuce (*Pistia stratiotes*), the other from water free of this plant.

In places where *A. rivulorum* and *A. funestus* type form occurred together in Kenya, only adults of the latter were found in human dwellings; the authors therefore believe that *rivulorum* does not play any important part in the transmission of malaria. In S. Africa DE MEILLON (this *Bulletin*, 1936, Vol. 33, p. 845) recorded similar

observations when comparing habits of *A. leesonii*, Evans (another member of this series) and *A. funestus* type form.

Evidence is gradually accumulating and may yet show that in this series of *Anopheles* the house-frequenting habit is entirely confined to the type form. More work is needed, particularly with regard to determinations of the kind of blood required by the various species and the natural infection rate among them.

H. S. Leeson.

EVANS (A. M.) & SYMES (C. B.). *Anopheles funestus and its Allies in Kenya*.—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 105–112. With 3 figs. on 1 plate & 1 map.

"Three members of the *funestus* series, *A. funestus* type form, *A. rivulorum* and *A. leesonii*, can definitely be recorded from Kenya.

"In comparison with the common and widely distributed *A. funestus* type form, *A. rivulorum* and *A. leesonii* may be described as localized or rare.

"It is more than probable that in most parts of the Colony, at least, *A. funestus* type form is the only one of these three species which is found in appreciable numbers in huts or houses; thus there is little, if any, doubt that records of natural infectivity in '*funestus*' in the Colony do actually apply to the type form of this species.

"Many of the larvae raised from eggs at Kisumu were abnormal in having the paired platelets isolated from the main plate on some or all of segments IV–VI. This condition was extremely rare among caught larvae. Such specimens differ from larvae of *A. funestus* var. *confusus* in having the main tergal plates unusually narrow."

ECKSTEIN (Fritz). Experimentelle Beobachtungen an *Anopheles maculipennis*. [*Experimental Study of Anopheles maculipennis*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Sept. Vol. 40. No. 9. pp. 381–395. [27 refs.]

The author presents an experimental study on two races of *Anopheles maculipennis*, hoping to lay bare the causes of their different geographical distributions.

It is known that speaking generally the race *atroparvus* has a coastal distribution, and that it sometimes breeds in brackish water: *messeae*, on the other hand, breeds in fresh water. Others have already shown, and it is here amply confirmed, that the larva of *atroparvus* is resistant to a higher concentration of salt than the other larva. This is true both of small and large larvae. [Some progress in understanding these observations might be made if the anal gills were studied as organs for the absorption of water, following the work of WIGGLESWORTH.]

The author then passes to a number of surface effects on water, which may clearly be of great importance to the *Anopheles* larva. He shows that if the surface is treated with some fine powder the larvae of *messeae* are more readily killed than those of *atroparvus* of the same age. This is shown with several different, apparently inert, powders, and with groups of larvae nourished in different ways. It appears that the death of the *messeae*, the cause of which remains obscure, is in some way related to the introduction of these powders into the tracheal system. The author is inclined to relate these observations to events which might be supposed to occur in nature, expressing the opinion that fine particles would float longer on brackish than on fresh

water, and suggesting that the larva of *atroparvus* resists powder because it is more habituated to a water surface which is dusty.

P. A. Buxton.

MISSIROLI (A.). Influenza di alcuni fattori climatici sull' *Anopheles maculipennis*. I. Nota. [The Influence of Climate on *A. maculipennis*.]—*Riv. di Malarologia*. Sez. I. 1936. Vol. 15. No. 6. pp. 385–398. With 3 figs., 3 graphs & 1 chart. English summary.

The paper describes observations and experiments on adult *Anopheles maculipennis* in a tunnel which provided a natural gradient of climatic conditions.

The author constructed a tunnel about 7 feet high and nearly 20 yards long, with a rectangular bend at the end, so that the extremity was in complete darkness; in this he set up a series of instruments which measured temperature and humidity at various points. The tunnel was partly divided into four sections, each of which had a characteristic range of humidity, temperature and light. In order to discover which of the sections was the one in which the adults would live longest the author reared specimens of *A. maculipennis* of two races, gave them a single meal of blood and put them in cages in different parts of the tunnel, and recorded the mortality daily. The number of specimens used was very small, and the experiment was not apparently repeated, but it appears that the insects lived longer in the deeper parts of the tunnel. In a second set of experiments specimens which had been reared and fed once, were kept in cages at different positions; in this experiment it was observed again that the mortality was less in deeper parts of the tunnel than near the mouth, and regular observations on digestion and on the maturation of the ovaries were made. It was found that the ovaries matured most rapidly in the first section, and that they took progressively longer in the deeper parts of the tunnel. The result is rather unexpected because climatic conditions, as shown on the graphs which are reproduced in the paper, do not appear to differ greatly once one has passed beyond the first section of the tunnel. The author also liberated a number of mosquitoes in the tunnel, closing its door with a wire screen. They showed a definite preference for the second section and none of them rested in the fourth, completely dark, section. Later, as the eggs began to mature, the insects moved nearer and nearer to the entrance, so that apparently their behaviour is complex, depending to some extent upon their physiological state.

The author expresses the view that female *A. maculipennis* show a preference for the climatic conditions which are most favourable for the development of the ovaries rather than for the life of the individual.

P. A. B.

REUTER (J.). Oriënteerend onderzoek naar de oorzaak van het gedrag van *Anopheles maculipennis* Meigen bij de voedselkeuze. [A Preparatory Investigation on the Cause of the Behaviour of *A. maculipennis* in the Choice of Food.] Proefschr. Rijksuniv. Leiden. 1936. 118 pp. With 6 figs. [5 pages of refs.] English summary. [Summarized in *Rev. Applied Entom.* Ser. B. 1936. Sept. Vol. 24. Pt. 9. pp. 223–225.]

“A given species or race of Anopheline can be of importance as a vector of malaria only if it maintains constant contact with man,

as otherwise it is likely to inoculate the sporozoites into animals. The reasons for a mosquito being zoophilous or anthropophilous have not been ascertained. The present thesis records work in Holland investigating whether food preferences exist and what stimuli induce feeding. The varieties of *Anopheles maculipennis*, Mg., used were *atroparvus*, van Thiel, and *labranchiae*, Flin., the first being known as zoophilous and the second as anthropophilous. The literature on food preferences of Anophelines is surveyed.

"The author's experiments were made under the direction of P.H. van Thiel and were exploratory in character, for a definite judgment would require many other tests and also comparisons with other species of mosquitos. The period of maximum activity (including feeding) of *atroparvus* was so short as to render it undesirable to devote any part of it to developing an appropriate technique, and for this reason preliminary tests during the semi-hibernation period of *atroparvus* were made with laboratory bred females of *Aedes aegypti*, L., to find the stimuli causing them to seek blood. The technique thus worked out appeared suitable for *atroparvus* and was used during its active period.

"The females of *A. aegypti* were collected by introducing an arm into the breeding cage and were then immediately removed from the arm before they had sucked more than a negligible quantity of blood. The tests were made with an "imitation arm" fitted to one side of an iron gauze cage, so as to project horizontally into the interior. It consisted of a glass cylinder 18 inches long and 2 inches in diameter. Warm water, mixed to the desired temperature from cold and hot pipes, flowed into the cylinder at its outer end and was taken away at the inner end, the outflow pipe being bent downwards and back parallel to the cylinder until outside the cage beneath the inflow pipe. Two strips of filter paper about $2\frac{1}{2}$ inches wide were hung on the arm so as to provide a rough surface. In tests on the effects of humidity and odours one strip was moistened with distilled water and the other with a solution of odoriferous substances. The outer surface of the paper was kept at 30–35°C. [86–95°F.], approximating to the temperature of the human arm.

"The various acids in human sweat did not attract *A. aegypti*. Moisture was distinctly attractive, and warmth was essential to induce feeding. When the water in the cylinder was at about 25°C. [77°F.] the mosquitos were quiet; they became active when it was at about 28°C. [82.4°F.].

"For the experiments with *atroparvus*, the females were captured in pig-sties, and 50–75 were placed in the cage daily. Warmth was the foremost requirement, the mosquitos flying up and settling on the paper, which they tried to puncture, when water at 30–40°C. [86–104°F.] was passed through the cylinder. Moisture did not attract *atroparvus* so much as *A. aegypti*. No preference for any colour was observed with wet or dry white, grey or red papers. Tests were made with acids, human sweat, cotton wool rubbed on the skin of man and pig, pig faeces, skatol, indol, ammonia, human and pig blood, and with a human arm. The only distinct stimuli were produced by human and pig blood and pig faeces. It appeared very probable that temperature by itself was sufficient to cause feeding. In most tests *atroparvus* preferred the blood of pig to that of man, but sometimes the blood of a particular man was more attractive.

"Other experiments were made in which *atoparvus* was given the whole evening and night in which to make a food choice. The special cage used is described and the results are tabulated. There did not seem to be any definite food preference nor any attraction by sweat or the acids in sweat. In yet other experiments the females were placed in a cage midway between a wooden box containing a pig and one containing a man. The cage communicated with each box by means of a length of stove pipe, and the mosquitos were given the whole evening and night to make their choice. The results are recorded in detail. The pig was generally the more attractive, but individual attractiveness varied greatly. The choice appeared to depend primarily on temperature and to a less degree on air humidity. If the temperature stimulus was insufficient, an increase of humidity could reinforce it, but temperature was always required. In view of tests with an odourless attractant and of the fact that with an increase of humidity man could become as attractive as a pig, it appears that odour plays little if any part. It is suggested that the attractiveness of the pig is due to the enhanced warmth and humidity produced by it as compared with man, and that the character of a house or animal shed must be of importance.

"The same apparatus was used with var. *labranchiae* in experiments to test whether its reputed preference for feeding on man really existed. The mosquitos were bred from eggs received from Rome in July and August 1935. They did not appear to show a preference for man.

"In observations on *atoparvus* in the field, the mosquitos leaving and entering a pig-sty were counted, and the temperature and humidity were recorded. The mosquitos were most active between half-an-hour before and half-an-hour after sunset. At first they left the sty and later they sought to enter. They need stimuli in order to find food, and enter a pig-sty in the morning not primarily to find a host but for shelter. The temperature and humidity of the air streaming out of houses and sheds at the time of maximum activity are greater than that of the outer air, and these two factors probably suffice to attract *atoparvus* inside. The "malariousness" of small working class dwellings with many inmates is ascribed to the many mosquitos found there and to the ease with which a few mosquitos can infect several persons."

MER (G.). Variations saisonnières des caractères de *Anopheles elutus* en Palestine. II. [Seasonal Differences in Morphological Characters of *A. elutus* in Palestine.]-*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 38-42. With 1 chart.

There is no doubt that many of the differences between races of *Anopheles maculipennis* are genetic, but it is also clear that within one race there is much variation, some of which is apparently due to seasonal changes in climate or water. The differences recorded in this paper should clearly be referred to the second category. The material which was studied consisted of specimens belonging to one race only (*elutus* or *sacharovi*) collected in a small area in Palestine.

The greater part of the present paper is a discussion of measurements of length of wing and of thorax of individuals collected in different months over more than one year. It is approximately true to say that in summer, when the water temperature is 25-26°C., the insects are

smaller than in winter (water temperature is 18–20°C), but the matter is complicated because in summer wings tend to be shorter relative to thorax.

P. A. B.

ROUBAUD (E.) & TREILLARD (M.). Sur une variété portugaise de l'*Anopheles maculipennis* (groupe *atroparvus*). [A Portuguese Variety of *Anopheles maculipennis* (Group *atroparvus*).]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 726–730. With 2 figs.

At the end of this paper the designation *cambournaci* is proposed for what is the latest addition to the named races or varieties of *A. maculipennis*. The name chosen is in honour of Dr. F. CAMBOURNAC, who, from the region of Aguas de Moura, Portugal, forwarded by air to Paris, living adults which, 48 hours after their arrival at the beginning of March, obligingly produced batches of fertile eggs. The latter gave rise to a strain whereof successive generations have since been reared in the insectary. Though the eggs laid by the Portuguese females are, from their general appearance, clearly allied to those of *atroparvus*, with which they had previously been identified by local authors, they are at once distinguishable owing to the small size of the floats. This can be appreciated by comparing the float-indices (*i.e.*, mean ratios between length of float and total length of egg), which, according to country of origin, are as follows:—Portugal, 0.24–0.29; Vendée, 0.37; Holland, 0.40; Italy, 0.38. While the markings on the Portuguese eggs resemble those on the eggs of *atroparvus* fairly closely, and the intercostal membrane is smooth, the mean number of ribs in the floats is smaller—13 to 14, instead of 16 to 18. The float-characters in question have remained stable throughout many generations of the Portuguese strain, which were bred in Paris.

From the results of crossing experiments with French *atroparvus* it is likewise concluded that the smallness of the floats in the Portuguese type is a dominant genetic character, and that the Portuguese *maculipennis* represent a special variety or biotype, distinct from *atroparvus*, though closely resembling it in various morphological and biological details.

The Portuguese form is definitely zoophile; its maxillary index is about 16, and, like *atroparvus*, it is stenogamous, *i.e.*, it breeds freely in confined spaces. Possibly differences from *atroparvus* will be found in its winter behaviour; the fact that in the Paris laboratory, at the beginning of March and at normal indoor temperature, Portuguese females all oviposited after a single meal of blood seems to show that in them the winter diapause is subject only to temperature, and that homodynamy is the rule. Should this be the case, it would afford a further distinctive character between the two races. E. E. Austen.

ROUBAUD (E.) & COLAS-BELCOUR (J.). Influence favorable d'une légumineuse fixatrice d'azote sur le développement d'un plankton nitrophile propice aux larves d'anophèles. [Favourable Influence of a Leguminous Fixative of Nitrogen on the Development of a Nitrophilous Plankton propitious to Anopheline Larvae.]—*Bull. Soc. Path. Exot.* 1936. July 8. Vol. 29. No. 7. pp. 798–805.

With the practical object of obtaining in suitable abundance batches of mosquitoes for use in transmission experiments, the authors,

working in the Entomological Laboratory of the Institut Pasteur, in Paris, tried various methods of rearing newly hatched larvae of *Anopheles maculipennis* var. *cambournaci* (vide supra). When the larvae were placed in solutions containing either nitrate of ammonium or acetate of soda, to the first of which a green Flagellate, *Euglena gracilis*, was added, while into the second the colourless Flagellate *Chilomonas paramecium* was similarly introduced, the Flagellates prospered, but results as regards survival and growth of the larvae were not satisfactory. The question arose whether, in natural breeding places, there are not definite associations between certain submerged plants and particular elements of the plankton, such as the Flagellates or certain types of algae, which result in conditions more especially favourable to easy, abundant and rapid development of the larvae. In this connection the authors' attention was directed to the part that may be played by leguminous meadow plants, which fix nitrogen, in supporting nitrophilous Protozoa, such as *Euglena*, which are among the regular constituents of the food of anopheline larvae. The attempt was then made to obtain a more suitable plankton by introducing clumps of white clover into jars containing tap water; in the case of controls, sods of turf, sprouting lentils in pots of sand, or ordinary vegetable mould were employed in place of the clover. In each instance the tap water was charged with *E. gracilis*, *Ch. paramecium* or some other Flagellate, which, as in nature, assists in forming a superficial planktonic pellicle, whereon the larvae feed.

Details are given of three experiments, in each of which two or more jars were used. It was found that the media most favourable to the rearing of larvae of the strain of *A. maculipennis* employed were those in which the water had been charged with *Chilomonas* and *Euglena*, and provided with a clump of clover, either simply immersed in the liquid or placed in a pot. It is to be supposed that the clover, and indeed any leguminous fixative of nitrogen, diffuses round itself nitrates, which are utilized by the Euglenids and green algae, which serve to feed the larvae and supply the water with oxygen. White clover was employed because it was the only species available at the beginning of the experiments, and because it resisted partial submersion of its roots; other leguminous plants, especially those which grow habitually in damp soils, would doubtless serve as well, if not better.

The authors add a footnote to the effect that, subsequent to the carrying out of the experiments described, they have applied the same technique to other races of *A. maculipennis*, with equal success.

E. E. A.

ROZEBOOM (L. E.). **The Life Cycle of Laboratory-bred *Anopheles albimanus* Wiedemann.**—Reprinted from *Ann. Entom. Soc. America*. 1936. Sept. Vol. 29. No. 3. pp. 480-489. With 1 chart.

Anopheles albimanus is a very important carrier of malaria in certain parts of tropical America. Its biology in nature is known in considerable detail. The present paper contributes detailed, quantitative studies made in the laboratory.

The paper contains a large body of numerical fact on the mortality and duration of life of different stages, the number of eggs that the female lays, the secondary sex ratio and similar matters. The work

was carried out at 80–86°F. (26.7–30°C.). The information is valuable, being based on very numerous experiments, but it can hardly be summarized. It is concluded that the female requires at least a week after emergence from the pupa and at least one blood feed before eggs are mature; the egg stage occupies 40–48 hours, the larval stages generally 8–13 days, and the pupal 30–33 hours; adults generally emerge in the afternoon or evening. As an approximate figure, one generation occupies 18–24 days. It has been observed that the female is particularly willing to take human blood after a batch of eggs has been laid, and it is suggested that this may bring her back to habitations after visiting the breeding place.

P. A. B.

BAISAS (F. E.) & HU (Stephen M. K.). *Anopheles hyrcanus* var. *sinensis* of the Philippines and Certain Parts of China, with Some Comments on *Anopheles hyrcanus* var. *nigerrimus* of the Philippines.—*Monthly Bull. Bureau of Health*. Manila. 1936. June. Vol. 16. No. 6. pp. 205–242. With 6 plates & 2 figs. [52 refs.]

While the Oriental *A. hyrcanus* appears, like *A. maculipennis*, to include a number of varieties, the var. *sinensis* itself “exhibits the puzzling characteristic of being an efficient malaria carrier in some places and not in others.” After studying batches of eggs from various localities, the authors write:—“Three distinct types of eggs can be recognized under the *sinensis*-group of China and the Philippines. First, the wide-decked variety which appears to be present in China, Indo-China, Japan, Hong Kong, Malaya, Borneo, and Sumatra, but not in the Philippines. We assume that this is the true *sinensis* of Wiedemann, and the one responsible for malaria transmission in nature. Second, the narrow-decked variety which is found in China and the Philippines. We believe this should be erected into varietal rank for which the name *lesteri* is proposed. And, third, the form having a deck intermediary in width between the two other varieties. This is so far reported only from the Philippines and corresponds to the one for which Baisas (1935) proposed the name *pseudosinensis*.” There follow short, illustrated descriptions of these three types of eggs and of those of var. *nigerrimus*, which are indistinguishable from the eggs of *lesteri*, albeit in the other stages these two varieties are readily separable; notes on collecting; and details concerning the larvae, pupae and adults of the several varieties. The authors emphasize that “the best method in classification is to take into consideration all the characters found in the eggs, larvae, pupae and adults of a given species or variety.”

E. E. A.

URBINO (Cornelio M.). The Eggs of Some Philippine *Anopheles*.—*Monthly Bull. Bureau of Health*. Manila. 1936. July. Vol. 16. No. 7. pp. 261–275. With 1 fig. & 6 plates. [18 refs.]

From specimens deposited in captivity, illustrated descriptions are given of the eggs of the following:—*A. barbirostris* (types 1 and 2, and an unnamed variety); *A. hyrcanus* var. *sinensis* (with which var. *lesteri* of Baisas and Hu, *vide supra*, is treated as identical); *A. pseudo-barbirostris*; *A. minimus* var. *flavirostris*; *A. filipinae*; *A. mangyanus*; *A. vagus* var. *limosus*; *A. ludlowii*; *A. litoralis*; *A. subpictus* var. *indefinitus* (types 1, 2 and 3); *A. maculatus*; *A. karwari*; *A. annularis*; *A. philippinensis*; *A. kochi*; and *A. tessellatus*. In addition, the eggs

of *A. hyrcanus* var. *nigerrimus* (which, in agreement with BAISAS and HU—again *vide supra*—it is stated cannot be differentiated from those of var. *sinensis*—i.e., var. *lesteri* according to the authors in question) are figured but not described.

The above-mentioned descriptions are followed by a "Table for Separating the Eggs."
E. E. A.

KITCHEN (S. F.) & BRADLEY (G. H.). *Anopheles walkeri* Theobald as a Vector of *Plasmodium falciparum* (Welch).—*Amer. Jl. Trop. Med.* 1936. Sept. Vol. 16. No. 5. pp. 579-581.

It has been previously shown that *A. walkeri* is an efficient vector of *P. vivax*. This mosquito has recently been found in Central and Southern Florida. Nine of these Florida Anophelines were fed on a patient suffering from a *falciparum* infection whose blood contained very numerous gametocytes. As a control, twenty-six *A. quadrimaculatus* were fed on the same patient. Twenty *quadrimaculatus* became infected but only one *walkeri*. The infected *walkeri* developed only one cyst on the stomach. It is concluded that the southern form of *A. walkeri* is not an efficient vector of *P. falciparum*.
N. W.

EARLE (W. C.) & HOWARD (H. H.). The Determination of *Anopheles* Mosquito Prevalence.—*Bol. Asoc. Med. de Puerto Rico.* 1936. Oct. Vol. 28. No. 10. pp. 233-240. With 4 figs.

The determination of the density of Anophelines is of importance in most antimalaria campaigns. Regular catches of adult mosquitoes in certain fixed diurnal resting places is the method commonly adopted. The authors of this paper point out that the diurnal resting places of certain important malaria vectors in the tropics are not known. *A. albimanus* in Porto Rico is an example of such a vector; *A. grabhamii* is another. Most mosquitoes of this type are more or less zoophile. The method usually employed is only satisfactory for those mosquitoes that are definitely anthropophile.

The use of a trap with animal bait for studying the prevalence of *A. albimanus* in Porto Rico is described. Prolonged experience has demonstrated its value.
N. W.

EARLE (W. C.). *Anopheles grabhamii* (Theobald), a Possible Vector of Malaria.—*Bol. Asoc. Med. de Puerto Rico.* 1936. Oct. Vol. 28. No. 10. pp. 228-232.

A. grabhamii has been found only in the Greater Antilles and the Virgin Islands. Naturally infected specimens have been captured, but little is known of its importance as a malaria vector. The author has succeeded in infecting *A. grabhamii* with *Pl. falciparum* and the development of the parasite ran parallel with that in simultaneously infected *A. albimanus*, the most important local vector. He concludes that *A. grabhamii* may be a vector, but in Porto Rico, at any rate, it is not an important vector. It is not sufficiently prevalent and it is very markedly zoophile. It is capable of breeding in very densely shaded water.
N. W.

CAUCHI (J.), SELLERS (W.) & BUNKALL (J. D.). **A Method of testing Oils and Other Chemical Agents for killing Mosquito Larvae.**—*Bull. Entom. Res.* 1936. Dec. Vol. 27. Pt. 4. pp. 649-652.

Artificial mosquito-breeding pits two feet square are dug in low-lying ground where the water is very near the surface. They are dug of such a depth as to contain 8-12 inches of water. When breeding occurs its intensity is determined by taking four dips with a standard dipper, one along each side of the pit. The larvae are counted, roughly classified into culicines and anophelines, and returned to the pit from which they had come. It was found that 5 cc. of the larvicidal oil to be tested is a suitable amount for these areas of 4 square feet of water. After the larvicide has been applied the pit is covered with a specially made trap in which any adults that may emerge can be observed. No pit is used for more than one test.

The cover traps are constructed of $\frac{1}{2}$ inch board and have the shape of a truncated pyramid. Each of its four sides measures 3 ft. at the base, 6 ins. at the top and 3 ft. 3 ins. along each side. On the top of the cover is a cylindrical wire-gauze trap with wooden ends. Two sloping glass strips are fixed over a circular hole 4 inches in diameter on the top of the pyramidal cover; these glass slips are separated by an interval of $\frac{1}{4}$ in. along their upper edges. This slit is the only means whereby mosquitoes hatching in the pit can gain access to the trap. Each side of the pyramidal cover has a window 8 ins. by 7 ins.: two of these windows are of glass, two of perforated zinc sheeting. The cover is painted white inside and out.

The authors claim that these breeding pits enable the testing of larvicides to be carried out under more natural conditions than the laboratory affords. More reliable comparative results are obtained than by ordinary field tests: with these pits standard uniform conditions—area of water, quantity of larvicide, &c—are always secured.

N. W.

UL'YANISHCHEV (V. I.) & RIFLING (E. A.). **A New Preparation "Oleoarsenite" for Control of Mosquito Larvae.**—*Summary Sci. Res. Work Inst. Plant Prot.* 1935. Leningrad, Lenin Acad. Agric. Sci. pp. 473-475. [In Russian.] [Summarized in *Rev. Applied Entom.* Ser. B. 1937. Mar. Vol. 25. Pt. 3. p. 68.]

"Of various waste products of the oil-refining industry tested in the Azov-Black Sea Region as carriers for Paris green against Anopheline larvae, the best was oleogumbrin. This is a black powder, the particles of which average 15.85 microns; it has a specific gravity of 0.7 and contains 10 per cent. of waste oil, which prevents it from being wetted and keeps it on the surface of the water as a thin film for a period of over 10 days. The addition of 4 parts oleogumbrin to 1 part Paris green decreased by from 20 to 50 per cent. the amount of Paris green required for a given area of water. In large scale trials, in which nearly 160 sq. miles of water surface were dusted, the mixture invariably gave 100 per cent. mortality of Anopheline larvae. To obtain a larvicide cheaper than Paris green, however, oleogumbrin was tested in combination with a calcium arsenite insoluble in water, but soluble in weak acids. A 1:4 mixture, which was named oleoarsenite, killed all Anopheline larvae in 5-10 hours when used in the laboratory, and was applied in the field with equally successful results, a water surface of about 60 sq. miles being dusted with it in the autumn of 1934. The preparation of the mixture is very simple, it floats well and costs much less than any larvicide containing Paris green."

COVELL (G.) & AFRIDI (M. K.). **Experimental Application of Paris Green from Aircraft.**—*Records of the Malaria Survey of India.* 1937. Mar. Vol. 7. No. 1. pp. 93–103. With 2 diagrams, 2 figs. & 1 plate.

These aeroplane Paris green dusting trials were carried out in the Bela, the Jumna river-bed, in close proximity to Delhi. A Fox Moth biplane was used for the experiments and a detailed description of the hopper attached to the machine is given. Soapstone powder which was used as a diluent for the Paris green was very satisfactory. Successful results were obtained but for many reasons, those of danger and relative cost being important, the authors do not consider the method to be one of practical value in India in present circumstances.

N. W.

MAIL (G. Allen). **Thiodiphenolamine—a New Ingredient of Mosquito Larvicides.**—*Jl. Econom. Entom.* 1936. Dec. Vol. 29. No. 6. pp. 1144–1146.

This is a contribution from Montana State College Agricultural Experiment Station. Thiodiphenolamine, $S(C_6H_4)_2NH$, is very soluble in benzene and acetone, soluble in ether, and slightly soluble in alcohol. The addition of a small quantity of this substance to an oil greatly increases its larvicidal potency. In one series of experiments a 5 per cent. solution of thiodiphenolamine in acetone was added to Diesel oil; in another series a suspension of thiodiphenolamine in Diesel oil was used. In the latter experiment little difference was observed between the larvicidal action of a freshly mixed suspension and that of the supernatant liquid from such a mixture that had been allowed to stand for 24 hours. The protocol of this experiment is reproduced:—

Comparison of toxicities of freshly mixed thiodiphenolamine-Diesel oil, and mixture of same 24 hours old. Experiment started at 10.45 a.m. with 100 larvae to each dish.

Surface area of dish, sq. cm.	Material	cc. used	Per cent. dead at				
			11.45 a.m.	1.45 p.m.	2.45 p.m.	3.45 p.m.	4.45 p.m.
800	Diesel oil alone ...	0.3	6	10	22	40	55
800	Supernatant liquid from 100 cc. diesel oil + 0.5 gm. TDPA ...	0.3	47	89	98	99	100
721	Fresh suspension of 100 cc. diesel oil and 0.5 gm. TDPA	0.3	21	67	84	90	97

N. W.

SCOTT (David T.). **Malarial Control Measures by Vertical Drainage (Percolation Pits).**—*Proc. Ann. General Meeting Assam Branch Brit. Med. Assoc., Shillong, March 4, 5 & 6, 1936.* pp. 22–25. With 2 figs.

This paper describes the construction of percolation pits on a tea estate in the Bengal Dooars whereby breeding places of *A. minimus*

have been eliminated. Percolation pits must reach good stony pervious soil; in this case it was found at twelve feet. The water dealt with is the waste water from water tanks. The tank plinth leads into a concrete drain in the course of which there is a mud-trap which breaks the flow of water, thereby causing the deposition of silt. From the mud-trap the drain leads to a cattle-trough, the overflow from which goes to the percolation pit. The percolation pit is not filled with stones; stones were used at first but they quickly became covered with slime. The pits are covered and fitted with a well-fitting manhole and the lead-in drain is furnished with a self-acting flap. These latter precautions were found to be necessary to eliminate the breeding of culicines.

N. W.

OVTCHINIKOV (K. M.), TISCHENKO (C. D.) & MOROZOVA (L. I.). **Observations on the Effect of Different Rates of Flow in Canals and of Small Water-Falls on Larvae of *Anopheles maculipennis*.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 1. [In Russian pp. 37–54. With 4 figs. English summary pp. 54–55.]

The minimum rate of flow usually recommended, 0.2 m. per second, will not prevent growth of vegetation and silting up of the canal bed; 0.25–0.4 m. is necessary, according to natural conditions. Flushing with a wave of speed 0.2–0.5 m. did not, in the authors' experiments, destroy larvae of *A. maculipennis*, except in the first stage; even repeated waves at definite intervals had little effect in shifting the larvae. Larvae passing through lock systems at flood gates and watersheds were destroyed by the fall up to 17–40 per cent., but the proportion destroyed varied greatly, 60 per cent. or so of those of the first instar, only 3.5 per cent of the second and third; it seems to depend on the fall, so that installation of a series of falls might be most beneficial in larval destruction.

H. H. S.

SOTIRIADÈS (D.). **Passive Immunity in Experimental and Natural Malaria.**—*Jl. Trop. Med. & Hyg.* 1936. Nov. 16. Vol. 39. No. 22. pp. 257–260. With 4 charts. [12 refs.]

The author states that during the past year he has studied the therapeutic action of the serum, or whole blood, of patients suffering from general paralysis, who had been treated some time previously with malaria-therapy (*P. vivax*), on other paralytics suffering from acute experimental malaria. It is difficult to draw conclusions from the details furnished of six such cases, each of whom received an injection of 20 cc. of blood. The author states that such an injection is followed by abatement of fever generally after the fourth or fifth bout. The work was done in Berlin in collaboration with P. JOSSMAN. In three cases the blood was examined every three hours after the injection to determine the influence of such injection on the leucocytic formula; charts are given. In the cases observed the leucocytic formula remained within normal limits not showing the changes characteristic of tertian malaria.

N. W.

ASHFORD (Mahlon). **The Nature of Immunity to Malaria in its Relationship to Anti-Malarial Therapy.**—*Amer. Jl. Trop. Med.* 1936. Nov. Vol. 16. No. 6. pp. 665–678. [13 refs.]

The author, justifiably confused by the puzzling contradictions contained in the reports of many competent observers regarding the

nature of immunity to malaria and the effect of drugs on such immunity, has confronted the opinions of some of the foremost authorities in this field. Summaries are given of the views of JAMES, CRAIG, RUSSELL (F. F.), CLARK, the League of Nations 1933 Report, GARNHAM, Gordon THOMSON, GILL and BOYD. As a result of this study the conclusion is reached that immunity to malaria has at least two elements, one plasmodicidal, the other antitoxic. The author thinks that conflict of opinion may be in part due to failure to recognize the dual nature of malaria immunity. N. W.

ESTER (Ferrando). Sul comportamento di alcune sieroreazioni della sifilide sul siero di sangue dei non luetici inoculati sperimentalmente con malaria terzana benigna. [**The Effects of Inoculated Malaria on the Serum Reactions in Non-Syphilitic Subjects.**]—*Giorn. di Batteriol. e Immunol.* 1936. Oct. Vol. 17. No. 4. pp. 502–517. English summary (9 lines).

The Wassermann, Müller and Sachs-Witebsky reactions were tried with the serum of ten non-syphilitics treated with therapeutic malaria with the following results. At the height of the febrile paroxysm the W.R. might prove positive (it did so in 8 of these) but administration of quinine brought it back to negative. [Positive reactions have been recorded in cases of malaria where there was no clinical indication or history of syphilitic infection.] Müller's reaction was positive in none of the cases, the Sachs-Witebsky was positive in four, and weak in a fifth. Hence in cases where a suspicious W.R. is obtained, confirmation or refutation should be sought by performing the other reactions and particularly the second. H. H. S.

VENOMS AND ANTIVENENES.

CÉSARI (E.) & BOQUET (Paul). Recherches sur les antigènes des venins et les anticorps des sérums antivenimeux (troisième mémoire). Venin de *Naja tripudians* et sérum anticobraïque. [On the Venom and Antivenene of *Naja tripudians*.]—*Ann. Inst. Pasteur*. 1936. May. Vol. 56. No. 5. pp. 511-534.

This is a continuation of these authors' interesting series of researches on snake venoms. They have already considered those of *Vipera aspis* and *Cerastes cornutus* [see this *Bulletin*, 1936, Vol. 33, p. 384] and now report on similar investigations on the cobra di capello, *Naja tripudians*. They proceeded, as before, to determine the toxicity of the venom *in vivo* to rabbits, guineapigs and mice, when it is injected by the circulation or subcutaneously. They found that for the first two of these animals the toxicity is practically the same as those of *V. aspis* and *C. cornutus*, but is less for mice. Next the anticoagulant action *in vitro* was studied and the haemolytic properties estimated. The cobra venom has a high potency in this respect, so minute a quantity as 0.000005 mgm. sufficing; this haemolytic action is destroyed by being heated to 100°C., much reduced by 90°C.; hardly at all affected at 80°C. The authors next determined the antitoxic titre on its own venom, using the same three animals, rabbits, guineapigs and mice, and then the antitoxic properties, if any, of the cobra antivenene to the venom of *V. aspis* and of *C. cornutus* and, *vice versa*, of each of the two last antivenenes to the *Naja tripudians* venom. For details, the original article must be consulted; the results are given in protocols. The results may be briefly summarized:—

Neither the anticoagulant nor the antihaemolytic potency corresponds with the antitoxic titre of the antivenene, nor does the precipitation or flocculation reaction give any criterion of the antitoxic properties. In fact, there is at present no means of estimating the therapeutic value of an antivenene except the crucial animal test of determining the dose which will bring about recovery from an otherwise fatal dose of the venom. The cobra antivenene has an action on *V. aspis* and *C. cornutus* venoms, though to a smaller degree than on the homologous venom. Though the coagulant diastatic principle is common to all, nevertheless, as in the case of the Viper and Cerastes, the coagulation of the blood plays no part in the toxic effects. The investigation points to the fact that there is a certain conformity in the antigenic constitution of the three venoms, that snake venoms contain an "antigen mosaic" whose constituents differ in their nature and action and thus, according to the predominance of one or other, give rise to the typical characters of certain venoms. This leads to a conclusion at variance with that of CALMETTE and ARTHUS that the antivenenes are strictly specific. They end the article with these words: Research, now in progress, on the properties of mixed antivenenes obtained by the combined venoms of *Bitis arietans* and *Sepedon haemachates* [*i.e.* a Viperid and a Colubrid] will show better still the correlations in antigenic constitution of the venoms of different species of snakes. This will be the subject of a future report.

GANGULY (S. N.) & MALKANA (M. T.). **Studies on Indian Snake Venoms. Part I. Daboia Venom: its Chemical Composition, Protein Fractions and their Physiological Action.**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 997–1006.

This is the first of a series of studies being carried out at the Central Institute, Kasauli. The authors show that in addition to colouring matters, daboia venom has as constituent elements, C,H,N,S and O, no phosphorus. They made determinations of the protein fractions, estimating the globulin, albumen and proteoses. The dried venom was found to contain 96·8 per cent. protein (15·5 per cent. protein nitrogen) and lipoids soluble in ether 2·8 per cent.; globulin 23·3, albumen 22·1 and proteoses 50·5 per cent. The neurotoxic action was tested on pigeons, the haemorrhagin on white rabbits, the coagulant action on sheep's blood, for locating the active principles in the venom fractions. These three actions are attributed to secondary proteoses. Attempts were made to separate the active principles of the venom by various absorption methods and by fractional precipitation with Am_2SO_4 and precipitation with acetone. These have not yet been successful.

H. H. S.

GANGULY (S. N.) & MALKANA (M. T.). **Studies on Indian Snake Venoms. Part II. Cobra Venom: its Chemical Composition, Protein Fractions and their Physiological Actions.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 281–286.

Having studied the chemical composition of Daboia venom, the authors have turned their attention to the venom of the Indian cobra. The elements present were the same—C,H,N,S and O—and, in addition, phosphorus. Identification of the proteins was undertaken and these were found to be albumen and globulin as coagulable proteins, and primary and secondary proteoses as incoagulable. Though phosphorus was present in the venom, no phosphoproteins were discoverable. Extraction with ether removed a dark brown viscid substance—a mixture of lecithin and cholesterol. Analysis of the protein proved the composition to be: Albumen 39·69, globulin 20·31, primary proteose 11·31, secondary proteose 16·81, together with lecithin, cholesterol, inorganic substances and colouring matter.

As a result of testing the physiological action of the various fractions, the authors found that the fraction obtained by saturation with Am_2SO_4 , representing the total proteins, contained the full toxicity, gauged by the effect in pigeons (the usual method at the Kasauli Institute for testing the neurotoxic action), while that separated by half saturation with Am_2SO_4 or full saturation with NaCl had no effect; the pigeons survived intramuscular injection of ten times the m.l.d. Further tests demonstrated that the toxicity of the venom was associated with the secondary proteose, but, in contrast with that of *Daboia*, is thermostable to a great extent. Hydrolysis of the proteose deprives it of all toxicity.

H. H. S.

GANGULY (S. N.). **Studies on Indian Snake Venoms. Part III. Enzymes in Daboia and Cobra Venoms.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 287–294.

An interesting sequel to the foregoing studies. The proteolytic enzymes were tested upon gelatin, crystallized egg-albumen, casein

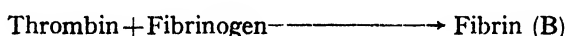
and fibrin; its powers of hydrolysing lecithin and of curdling milk were also investigated.

The author found that both venoms—cobra and daboia—would digest gelatin and egg-albumen to a degree comparable with the action of pepsin or papain, but less than that of trypsin, the cobra venom being more powerful than the daboia. The same held good as regards the action on casein in an alkaline medium. Both will digest fibrin. As regards lecithin, a lecithin-splitting enzyme was found in both venoms, more in that of the cobra. The cobra venom also has a powerful rennetic activity, that of daboia none.

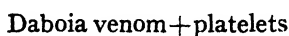
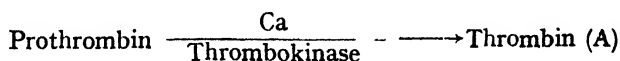
Finally, the action of the homologous antivenenes on the enzymes was tested *in vitro*. It was found that the proteolytic action is not neutralized, but the rennetic action of the cobra venom is neutralized. One cc. of Kasauli bivalent antivenene neutralized the milk clotting enzyme of 20 mgm. of the venom. H. H. S.

GANGULY (S. N.). **Studies on Indian Snake Venoms. Part IV. Mechanism of the Coagulant Action of Daboia Venom on Blood.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 525-529.

The theory in general acceptation at the present day regarding coagulation of normal blood is representable by the following scheme :—



The author prepared the prothrombin, thrombin, thrombokinase (platelets) and fibrinogen in a pure state with a view to finding out whether Daboia venom in bringing about coagulation plays a part in stage A or B. The experiments are detailed and the author concluded that the venom of *V. russelli* does not convert prothrombin to thrombin nor fibrinogen to fibrin; it acts as a lytic on the platelets, thereby liberating thrombokinase, as represented thus :—



Next, since moccasin venom possesses an antithrombin action, test was made to see whether this action could be neutralized by the venom of Russell's viper. The results, as shown in a protocol, suggest that either the Daboia venom can neutralize the antithrombic action of about twice the quantity of moccasin venom, or, if sufficient of the former is used, rapid conversion of prothrombin into thrombin occurs in such a quantity that the antithrombic action of the latter (moccasin venom) is counteracted. Further experiment showed that Daboia venom had no neutralizing action on the antithrombic property of moccasin venom, and the action of the former on blood was not that of neutralizing antithrombin. H. H. S.

GANGULY (S. N.). **Haemolysis by the Venom of the Indian Cobra** (*Naja tripudians*).—*Indian J. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 1165–1174. With 3 graphs.

The author has investigated the haemolytic action of *Naia tripudians* venom fractions on the erythrocytes of guineapig, monkey, horse, and man, using globulin, albumen, and primary and secondary proteose fractions and also the venom after extraction of phospho-lipoids. He then estimated the effects on the haemolysis of varying the lecithin and cholesterol content of the haemolytic system, with whole blood and with the red corpuscles of the same animals and of rabbit and sheep. The results are presented in graphs and protocols and summarized by the author as follows:—

"The haemolytic action of cobra venom is associated with a fraction composed of globulin and primary proteose. It has been demonstrated that lecithinase accompanies this fraction,

"Quantitative studies on cobra venom haemolysis with this fraction on the blood of different animals have shown that the percentage haemolysis of whole blood is roughly in inverse proportion to cholesterol content. No exact relationship has been shown between haemolysis and relative content of cholesterol and lecithin within certain natural ranges, but where cholesterol is in large excess of lecithin, venom haemolysis as a rule is slight in case of whole blood. This relationship is not shown in the case of washed cells where other factors may be concerned in the haemolysis."

H. H. S.

BINET (Léon), WELLER (Georges) & JAULMES (Charles). Le pouvoir antitoxique du glutathion. Recherches sur le venin de cobra. [**The Antitoxic Action of Glutathion on Cobra Venom.**].—*C. R. Acad. Sci.* 1937. May 19. Vol. 204. No. 20. pp. 1513–1514.

The antitoxic action of glutathion in mineral poisoning has been noted by several writers; the present paper deals with its effects relative to cobra venom. The test animal was the adult guineapig of 300–400 gm. weight. The venom was administered subcutaneously after solution in distilled water [the species of venom is not mentioned]; the venom in doses of 0.25 mgm. per kilo proved fatal to controls in 4–6 hours, and this was taken as the m.l.d. For the experiments aqueous solutions of reduced glutathion were used, 40 mgm. added to an amount of dried venom corresponding to 0.33 mgm. per kilo, the mixture made up to 1 cc., neutralized and left for an hour at laboratory temperature before being injected. The onset of symptoms was retarded and some animals survived. At first the neutralization was effected with bicarbonate of sodium, but as this was slow to stabilize, trisodium phosphate was used for later tests.

In a second series of experiments the mixtures of reduced glutathion and venom were adjusted colorimetrically to a definite pH, ranging between 6.6 and 8.4, by 10 per cent. trisodium phosphate. The results were survival of animals injected with mixtures of pH between 7.4 and 8.4, death of those receiving mixtures below 7.4 but with some delay in onset of symptoms. There is manifested, therefore, *in vitro* at least some antitoxic action.

H. H. S.

TAYLOR (J.), MALICK (S. M. K.) & GANGULY (S. N.). **Preservation of Coagulant Solutions of Daboia Venom.**—*Indian Jl. Med. Res.* 1936. Oct. Vol. 24. No. 2. pp. 521–524.

Daboia venom has proved its value as a haemostatic in haemophilia and other causes of bleeding. The dried venom is not always at hand or readily procurable and even if this difficulty is surmounted it is not always practicable to make up on the spot the high dilution necessary for therapeutic use. Hence the value of a stable solution of reliable coagulant potency. The authors have experimented with the following solutions :—

1. 1 in 500 aqueous solution of the venom with an equal quantity of glycerine, *i.e.*, a final strength of 1 in 1,000.
2. 1 in 1,000 aqueous solution in an atmosphere of CO₂.
3. The same concentration with addition of 0.4 per cent. tricesol.
4. The same aqueous solution plus 1 in 10,000 mercurial preservative (as used for sera and other biological products).

It was found generally that deterioration of coagulant activity corresponded closely with loss in toxicity. The authors concluded that the first of the above retains the coagulative power and is highly active in a dilution of 1 in 10 (*i.e.*, 1 in 10,000 of the venom). *H. H. S.*

TAYLOR (J.) & MALICK (S. M. K.) **The Action of Rattlesnake and Moccasin Venoms as compared with Indian Viper Venoms.**—*Indian Jl. Med. Res.* 1936. July. Vol. 24. No. 1. pp. 273–279.

Following up previous work [see this *Bulletin*, 1936, Vol. 33, p. 387] the authors have made a study of the venoms of *Crotalus adamanteus* and *Ancistrodon piscivorus* from America, in respect of their neurotoxic, haemorrhagic and blood-coagulant actions, as compared with those of the *daboia* (*V. russelli*) and *E. carinata*. They find that the haemorrhagin content of the American snakes is similar to that of the Indian phoorsa (*Echis*) but ten times that of *daboia*; the haemorrhagin of all four is, however, of the same nature and is therefore neutralized by the *daboia* antivenene. The *daboia* has twenty times and the *echis* four times the neurotoxin content of the *Crotalus* venom; that of the moccasin (*Ancistrodon*) is, in this regard, half that of *Crotalus*; moreover the neurotoxins of the American species examined differ specifically from those of the two Indian species and are consequently not neutralized by the antivenenes of the latter. *Crotalus adamanteus* venom has a coagulant action but is much below that of *V. russelli* or *E. carinata* in high dilutions and this action is not neutralized by *daboia* antivenene. *H. H. S.*

PECK (Samuel M.), ROSENTHAL (Nathan) & ERF (Lowell). **Purpura. Classification and Treatment, with Special Reference to Treatment with Snake Venom.**—*Arch. Dermat. & Syph.* 1937. May. Vol. 35. No. 5. pp. 831–864. With 14 figs. [26 refs.]

This article is replete with information and more than one reading is needed if its full value and significance are to be grasped. The varied nature of purpuric manifestations is dealt with, the procedures for studying the blood and the capillaries and a detailed description of the intradermal venom test with moccasin venom—injection of 1 or 2 units of haemoglobin, the result being noted in an hour or a little under. In a table is set out the relationship of haematologic and

dermatologic purpura to moccasin venom intradermally administered. The histology of the various purpuric conditions is somewhat condensed and would be worth amplifying in a separate paper, but is included in order that the action of the venom can be demonstrated in treatment.

For therapeutic purposes, the initial dose for those under ten years of age was 0.2 cc. of a 1 in 3,000 dilution, and increased to a maximum of 1.0 cc. For adults these doses were doubled. Treatment was usually given twice weekly in arm or thigh. An ecchymosis might develop in the first 24 hours, and some patients showed hypersensitivity after 10-14 days' treatment, when desensitization might be called for. Some typical clinical records follow, with a discussion on the use of the moccasin venom for diagnosis, prognosis and treatment. The paper was followed by an interesting discussion, and in his reply Dr. Peck explained that his procedure was basically a titration of the haemorrhagins in the venom and that cobra venom did not give a positive reaction because it was deficient in the haemorrhagins though rich in haemolysins. Later, he proposes to undertake a chemical fractionation.

H. H. S.

GRASSET (E.). **On the Interrelation of the Antigenic Properties of Snake Venoms and its Bearing upon the Polyvalence and the Assay of Sera.**—*Quarterly Bull. Health Organisation. League of Nations.* Geneva. 1936. June. Vol. 5. No. 2. pp. 367-390. [55 refs.]

Tests carried out in cross-neutralization of venoms have shown the necessity of preparing specific antibodies not only of the two groups Viperidae and Colubridae, but of their chief subfamilies and genera, e.g., against the venoms of European vipers, North African Cerastes, South African Bitis, Indian *V. russelli* and Lachesis and Crotalines of South America. Though some of these have a common antigenic nucleus, they differ in secondary antigenic fractions. Studies of the effects of antivenenes of one species against the venom of another have been made and recorded [see this *Bulletin*, 1936, Vol. 33, pp. 382, 398]. If one of the antigens used comprises the fractions contained in the other venoms, group and generic neutralization will be greater and more easily obtained. Further "the relation in which group antigenic properties stand to special individual antigenic properties can be shown by testing sera prepared with single venoms for their specific neutralizing power against that particular antigen and also for their comparative group neutralization power against the other venoms of the group or species concerned."

CALMETTE concludes from his investigations that the neurotoxic function of all the reptilian poisons is identical. The South African antivenene has a higher neutralizing effect on the Indian cobra venom, *N. tripudians*, than upon the Cape cobra venom, *N. flava*, used in its preparation, but the reverse of this holds good as regards the Indian serum. Therefore, the African *N. flava* venom has a higher specific and group antigenic potency than that of *N. tripudians* [see GRASSET and ZOUTENDYK, this *Bulletin*, 1936, Vol. 33, p. 382]. By determining test doses of the different venoms relative to the antivenene unit adopted for these specific sera, and carrying out assays of the polyvalent serum in relation to these test doses, it will be possible, says the author, to estimate the antibody content of this serum in terms of

anti-Cobra and anti-Bitis units, and the assay of antivenenes in relation to standard sera has many advantages, theoretical and practical, over direct neutralization tests and an international standardization of antivenenes analogous to that of bacterial antitoxins would provide a satisfactory reference standard; the choice of animal (rabbit, pigeon, mouse), the temperature at which and the length of time during which the mixtures are allowed to stand, in fact, the technique generally and in detail, must be decided upon as necessary preliminaries.

H. H. S.

CÉSARI (E.) & BOUQUET (Paul). Recherches sur le venin de la vipère lébétine (*Vipera lebetina*). [**On the Venom of *Vipera lebetina*.**]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 4. pp. 335–337.

The venom with which the authors worked was a mixture from about a hundred of these snakes captured in Algeria. Four mgm. injected into the vein of a 2 kgm. rabbit proved fatal in 10 hours, 8–10 mgm. in less than an hour. Post-mortem, small haemorrhages were found in the subcutaneous tissue, intestine, diaphragm and pericardium; the peritoneum contained several cc. of blood, the ureters also were full, the lungs and kidneys pale.

Of other venoms, the fatal doses for rabbits weighing 2 kgm. were *V. aspis* 0·7 mgm., *Cerastes cornutus* 1 mgm., *Bitis arietans* 2 mgm. Clinically, the symptoms of poisoning by *V. lebetina* resemble those of *B. arietans* rather than those of the other two, which produce death in 5 minutes with massive coagulation of the blood.

The guineapig is more susceptible to *V. lebetina* venom than is the rabbit; 0·4 mgm. kills a 400 gm. guineapig in about 30 minutes; for a mouse of 20 gm. the fatal dose is 0·05 mgm. into the caudal vein, 0·1 mgm. subcutaneously.

The authors, having no specific antivenene at hand, tested the action of others, using two fatal doses, 4 mgm. per kilogram body weight, and varying amounts of antiserum obtained from horses, injecting after leaving them in contact at 37°C. for half an hour. They found that *V. aspis* antivenene, of which 0·3 cc. neutralizes 1 mgm., had to be given in doses of 3 cc. to neutralize 1 mgm. *V. lebetina* venom; a mixture of *B. arietans* antivenene, of which 0·4 cc. neutralizes 1 mgm., and *Sepeidon haemachates*, of which 2·8 cc. neutralizes 1 mgm., had to be given in a dose of 4 cc. to neutralize 1 mgm. of *V. lebetina* venom; *Naja tripudians* antivenene, of which 1 cc. neutralized 1 gm., had to be given in a dose of 1·5 cc. against 1 gm. of *V. lebetina* venom. Of the three antisera tried, therefore, the last proved the most potent.

H. H. S.

MERCHANTE (F. R.). Composition des venins de serpents et action comparative des globulines et albumines. [**Composition of Snake Venoms and the Actions of the Globulins and Albumens compared.**]—*C. R. Soc. Biol.* 1936. Vol. 122. No. 19. pp. 487–489.

Briefly stated, the author's methods were as follows: The nitrogen was estimated by the Kjeldahl process, the non-protein nitrogen after removal of albumen by sulphosalicylic acid, the water by drying for 3 hours at 110°C., ash by weighing after calcining, the sulphur by Benedict's method, tyrosine and tryptophane by that of

Folin and Marenzi, cystine by a modified process of the same workers. The albumens and globulins were separated by Howe's method: 25 mgm. of the venom were dissolved in 1 cc. of salt, 0.9 per cent., and to this was added anhydrous sodium sulphate 24 cc. of a 22.2 per cent. solution. In a table are given the results in grams per cent. of the venom, for six species of Bothrops, *Crotalus horridus*, *Trimeresurus flavoviridis*, *Daboia russelli*, and *Naja naja*. The albumens were found to be more abundant than the globulins, the percentage of tyrosine was about that of other proteins, tryptophane and cystine in larger proportion. The proteolytic and local actions are chiefly due to the albumen fraction and the clotting of milk, which was tested, due to the globulin fraction. The haemolytic action, the toxic (tested on the pigeon) and the reduction of blood tension (tested on the dog), was shared by both fractions, the albumen being a little more powerful. The coagulant action was due rather to the albumen fraction, but weight for weight the globulin fraction was more potent in this respect.

H. H. S.

GHOSH (B. N.) & DE (S.S.). The Migration of the Toxic Constituents of Cobra (*Naja naja*) Venom at Various pH in an Electric Field.—*Indian J. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 1175-1182. With 1 diagram.

SUZUKI (Chikashi) & SUGIO (Kazuo). On the Relationship between Snake Venom and Bactericidal Complement. Observations into the Structure of the Bactericidal Portion of Complement as well as Notes upon the Theory of the Multiplicity of Complement.—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1936. Sept. Vol. 35. No. 9 (378). [In Japanese pp. 1965-1989. [28 refs.] English summary pp. 1989-1991.]

HOLDEN (H. F.) & SETTER (C. G.). The Ultra-Violet Absorption Spectra of Snake Venoms.—*Australian Jl. Experim. Biol. & Med. Sci.* 1935. Dec. 16. Vol. 13. Pt. 4. pp. 223-228. With 5 graphs.

HOLDEN (Henry Francis). The Absorption Spectra of Some Modified Snake Venoms.—*Australian Jl. Experim. Biol. & Med. Sci.* 1936. June. Vol. 14. Pt. 2. pp. 121-130. With 7 graphs.

TETSCH (Chr.) & WOLFF (K.). Untersuchungen ueber Analogien zwischen Bienen- und Schlangen(*Crotalus*)-Gift. [On the Analogies between the Venoms of the Rattlesnake and the Bee].—*Biochem. Ztschr.* 1936. Nov. 10. Vol. 288. No. 1-2. pp. 126-136. With 7 figs. [Refs. in footnotes.]

It has been noted by several authors (ESSEX, MARKOWITZ and MANN) that the action of bee-venom injected intradermally was almost identical with that of *Crotalus* venom and histamin. The authors have therefore undertaken a chemical analysis of these poisons in order to compare them and also made certain biological tests. Bee-venom was found to contain, in percentages, 43.6 carbon, 13.6 nitrogen, 7.1 hydrogen and 2.6 sulphur. That of *Crotalus terrificus* 44.9 C., 14.7 N., 6.6 H., and 3.6 S., while that of Cobra [species not mentioned] gave 45.2 C., 14.7 N., 7.0 H., and 5.5 S. The lethal doses for mice were respectively 6-10, 0.7 and 0.12 mgm. per gm. It will be noticed that the chief differences were in the

amounts of sulphur, and that the toxicity increased directly with that content.

Experiments carried out on the intestine of guineapigs with the whole venom and with fractions from the picrates showed that the bee-venom differed from that of *Crotalus* in containing a substance having a histamin-like action. *H. H. S.*

HAVEMANN (R.) & WOLFF (K.). Zur Frage der Eiweissnatur des Bienen- und *Crotalus*giftes. I. [On the Albuminous Nature of Bee- and Rattlesnake Toxins.]—*Biochem. Ztschr.* 1937. May 19. Vol. 290. No. 5-6. pp. 354-359. With 4 figs. [19 refs.]

By means of cataphoresis the authors demonstrated the amphoteric nature of a fraction of bee venom and of *Crotalus* venom [in neither is the species tested mentioned]. They regard this reaction as strongly indicative of their albuminous nature. The isoelectric point of the bee venom is at pH 8.7, that of *Crotalus* 7.8. The cataphoresis results were confirmed by titration. Bee venom is soluble with difficulty in alkaline fluids at pH 8.3; that of *Crotalus* only slightly at about its isoelectric point. Both dialyse readily through collodion and parchment. *H. H. S.*

KELLAWAY (Charles H.) & LEMESSURIER (D. H.). The Vaso-Depressant Action of the Venom of the Australian Copperhead (*Denisonia superba*).—*Australian Jl. Experim. Biol. & Med. Sci.* 1936. Mar. Vol. 14. Pt. 1. pp. 57-76. With 13 figs. [12 refs.]

Intravenous injection of moderate doses of venom of *Denisonia superba* (Australian copperhead), or *Acanthopis antarcticus* (death adder), which have no coagulant principle, causes a temporary fall of blood pressure, but a second dose has no effect. Desensitization can be produced by repeated injection of minute doses. The authors in the present article analyse this vaso-depressant action of the venom, employing chiefly cats for their experiments, but also monkey, dog, rabbit and guineapig. The effects were tested on anaesthetized cats, on decerebrate or decapitated preparations and on animals with vagi divided and carotid sinuses put out of action; also on curarized and atropinized animals and on isolated heart-lung cat preparations and others.

The authors found that desensitization with venom does not alter the animal's response to other pressor or depressor substances. The initial fall of blood pressure is not related to the curari-like action of the venom, nor to by-products of coagulative changes due to traces of thrombin in the venom. A possible hypothesis of the vaso-depressant action and stimulant action on plain muscle was that they might arise from liberation of histamine by the lytic action of the venom on the cells, but no histamine could be detected in the perfusate from a cat's lung following administration of venom; the effects are more probably the result of direct action of the venom on plain muscle. The article is illustrated by good blood pressure tracings. *H. H. S.*

AKATSUKA (Keiji). Immunological Studies of Snake Venoms.—*Japanese Jl. Experim. Med.* 1936. Apr. 20. Vol. 14. No. 2. pp. 147-183. [27 refs.]

The author has carried through an intricate piece of work in attempting to immunize certain animals—mice, guineapigs, rabbits

and horses—against the venoms of *Lachesis flavoviridis*, *Naja tripudians*, and precipitin experiments were also performed with the venoms of *Bothrops jacaraca* and *Naja naja atra*. A large number of experiments and the results are given in detail; these can only be summarized here. Readers desiring more should consult the original, in which the many points are clearly set out.

Immunization was carried out by injections of a mixed venom and antivenene, and by venom-antivenene precipitates, and with toxoid. The degree and duration of immunity produced are estimated and protocols of the results are presented. The following summarizes the main results :—

I.—As regards immunization against the *Lachesis* venom :—

1. Injection of the venom-antivenene mixture gave rise to immunity, but not of high degree.
2. The effect of using the precipitates was greatest after intraperitoneal injection, and then, in order, intramuscular, intravenous and subcutaneous.
3. Subcutaneous injection with toxoids produced high immunity in animals. The degree was greater 10 days after the final inoculation than after 3 days, particularly if the sediment was also injected. The effectiveness was practically the same after 14 weeks' incubation as after 6 weeks'; it is, therefore, wiser to employ the former for immunizing human beings. Immunity is maintained for several weeks, and the antigenicity of the toxoid is not impaired by heating to 60°C. for 30 minutes on 3 successive days.
4. Immunization of rabbits by cutaneous application of an ointment of the venom in lanolin to the shaven skin was high and persisted for 1–2 months.
5. Reimmunization by subcutaneous injection of toxoid was obtained more rapidly than the primary immunization.

II.—Active immunization against Cobra venom :—

1. Active immunization with increasing doses of venom must be carried out slowly and with caution.
2. The use of precipitates does procure immunity, but not very marked.
3. The toxoid, which was found to be no longer toxic after being kept for 6 weeks at 40°C., was apparently ineffective for mice and gave poor results in rabbits. This may be, in part, accounted for by the fact that the venom was denatured and had lost to some degree its antigenicity before it was used for preparation of toxoid.

Lastly, as regard precipitation of venoms by antivenenes; this was observed to be specific among Colubrids and Viperines; the antivenene potency and the precipitin titre of antisera might not run parallel, and the correlation between flocculation and neutralization of venom and antivenene *in vitro* differed both with the kind of venom and the animal employed for production of the antiserum.

H. H. S.

VON KLOBUSITZKY (D.). Biochemische Studien ueber die Gifte der Schlangengattung *Bothrops*. II. Mitteilung. Eine verbesserte Methode zur Herstellung von *Bothropotoxin*. [**An Improved Method of Preparation of Bothropotoxin.**]—*Arch. f. Experim. Path. u. Pharm.* 1936. Mar. 18. Vol. 180. No. 5/6. pp. 479–481.

The methods described by the author [this *Bulletin*, 1936, Vol. 33, p. 380], had the drawback that they produced only a small and variable amount of bothropotoxin, and the latter, besides having a toxic property, was also coagulative. For the new method, which is described at length, it is claimed that it yields a larger amount

of bothropotoxin and this has much stronger neurotoxic properties and much diminished coagulative power. The bothropotoxin so obtained is free from nitrogen, hydrogen, phosphorus and iron. Whereas the venom, from which it is prepared, has a minimum lethal dose of 0.26–0.27 mgm., that of the bothropotoxin is 0.055–0.060 mgm. A m.l.d of the original venom coagulates 5 cc. of oxalated horse blood in 4 minutes ; that of bothropotoxin only does so in 20 minutes.

H. J. Walton.

v. KLOBUSITZKY (D.) & KÖNIG (P.). Ueber die Bindung des Bothropotoxin durch Schlangenserum. [**The Union of Snake Venoms with Antivenenes.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Feb. 18. Vol. 87. No. 3/4. pp. 202–212. [18 refs.]

— & —. Ueber die Bindung des Bothropotoxin durch Schlangenserum. II. Mitteilung. Bindung durch Buschmeister- (Lachesis muta-) Serum.—*Ibid.* pp. 330–334.

None of the animal poisons which have been isolated in a more or less pure state, bee-venom, ophiotoxin, crotalotoxin, scorpion venom and others, has been tested as regards its immunological properties. Are these nitrogen-free poisons to be regarded as true toxins, with power to produce antigens, and to enter into specific combination with the homologous antibodies ?

The authors have isolated, in a nearly pure state, the toxic substance of a Brazilian viper, *Bothrops jararaca*. They have succeeded in preparing the active principle of this in a nitrogen-free condition and with a constant degree of toxicity. This bothropotoxin is a typical poison of the central nervous system, and causes death in pigeons within a few minutes by paralysis of the respiratory centre. Besides this neurotoxic property, bothropotoxin exerts a coagulative effect, though in a much less degree than the crude venom ; this is probably to be attributed to an impurity, which it has not hitherto been found possible to remove.

The experiments were carried out as follows :—

A 0.1 per cent. solution of bothropotoxin was made : the minimum lethal dose (m.l.d.) of this was 0.6 cc., or 0.06 mgm. The experiments were conducted both *in vitro* and *in vivo* ; in the former, a definite quantity of the bothropotoxin solution was mixed with different quantities of the snake antiserum, and the mixture, after standing for half an hour, injected into the wing-vein of pigeons. In the experiments *in vivo*, the bird was given a lethal dose of the toxin, and, as soon as the second stage of poisoning occurred, when the pigeon fell on its back, the *Bothrops* serum was given : this procedure is called by the authors, Type I. In Type II, the serum was given immediately after the toxin. In both types the serum was administered subcutaneously or intramuscularly. In the experiments with rattlesnake serum, besides the two types described above, a third set was carried out in which the serum and bothropotoxin solution were mixed together in the syringe, or else the serum was injected into the vein of one wing, and the bothropotoxin immediately afterwards into the vein of the other wing.

The experiments with *Elaps* serum were only carried out *in vitro*, and all gave a negative result.

The titres of the sera were found to be as follows :—

One cc. of monovalent *Bothrops* sera neutralized 3·8, 2·4, or 2·2 mgm. of crude venom of *B. jararaca*.

One cc. of rattlesnake serum neutralized 0·9 mgm. of the venom of the South American *Crotalus terrificus terrificus*.

One cc. of the bivalent *Elaps* sera neutralized 0·15 mgm. of the venom of *Micrurus corallinus*, and 0·25 mgm. of *Micrurus frontalis*.

The m.l.d. of dried *B. jararaca* venom is from 0·02 to 0·022 mgm., but the toxicity diminishes with time, and the m.l.d. may be as much as 0·6 mgm.; the loss of toxicity is probably due to oxidation. The venom used in the production of the bothropotoxin used in these experiments had a m.l.d. of 0·26–0·27 mgm. Since the m.l.d. of bothropotoxin is 0·06, this is about four to four and a-half times as potent as the former, but only one-tenth of the potency of the fresh venom. It was found that the toxic element of the venom only represented about one-third of the dried substance, so that the m.l.d. of fresh crude venom is really 0·007 mgm., and of that used for the production of bothropotoxin, 0·09 mgm. This last figure indicates what the m.l.d. of bothropotoxin should be theoretically; actually it is about one-third less, namely 0·06 mgm. The cause of the discrepancy will be discussed in a later communication; all that can be said now is that an early symptom is vomiting, which does not occur in poisoning with bothropotoxin.

In the experiments, both *in vitro* and *in vivo*, it was found that bothropotoxin combined with and neutralized its homologous serum just as whole venom does. When bothropotoxin and its antiserum were given, the result depended upon whether the amount of bothropotoxin was sufficiently in excess of that required to neutralize and combine with the serum to give the m.l.d.

In the rattlesnake experiments it was found that 1 cc. of rattlesnake serum neutralized 1·2 mgm. of the toxin of the corresponding snake, and 0·02 mgm. of that of *Bothrops jararaca*; that is, the rattlesnake serum was ten times as active in the former case. The experiments showed that rattlesnake serum, both *in vitro* and *in vivo* (only when given intravenously in the latter case), neutralized the same amount of bothropotoxin as *Bothrops* serum. The authors consider that this fact indicates that there is a close chemical relationship between the toxin of rattlesnake venom and bothropotoxin. There are several points of resemblance between the two; for instance, both are neurotoxic; again, when very large doses are given, the effect of bothropotoxin is more like that of rattlesnake venom than that of the whole venom of *Bothrops*; if 10–15 times the m.l.d. is given, *B. jararaca* venom causes death in a few seconds, that of *Crotalus terrificus terrificus* in 10–15 minutes, while bothropotoxin stands in an intermediate position, causing death in 3 minutes.

The authors summarize their results as follows :—

1. *Bothrops* serum neutralizes bothropotoxin both *in vitro* and *in vivo* in a definite proportion.
2. The South American rattlesnake serum also neutralizes bothropotoxin *in vitro* in a definite proportion.
3. The same serum neutralizes bothropotoxin in a definite proportion *in vivo* only when given intravenously.
4. *Elaps* serum has no combining and neutralizing power with bothropotoxin.

5. It is probable that there is a close chemical relationship between bothropotoxin and the neurotoxic substance of rattlesnake venom.

H. J. Walton.

VON KLOBUSITZKY (D.) & KÖNIG (P.). Biochemische Studien ueber die Gifte der Schlangengattung Bothrops. III. Mitteilung: Die Trennung der gerinnungsfördernden Substanz von dem Bothropotoxin und den uebrigen Sekretbestandteilen. [**The Isolation of the Coagulating Substance of Bothropotoxin from the Other Constituents of the Venom.**]*—Arch. f. Experim. Path. u. Pharm.* 1936. May 25. Vol. 181. No. 3. pp. 387–398. [18 refs.]

In a previous paper the authors described a substance, bothropotoxin which they have obtained from the venom of *Bothrops jararaca* (= *Lachesis lanceolatus*): it possesses neurotoxic and coagulating, but no haemolytic, properties. Earlier attempts to separate the coagulating from the toxic principle failed; they now describe the method by which they have succeeded in effecting this.

By suitable fractionization by means of ammonium sulphate, and subsequent dialysis under pressure for a period of eight days, a colourless solution was obtained, which gave a dry residue of from 0.30 to 0.34 per cent. When used in quantity equivalent to ten times the lethal dose (measured as dried residue) of the stock solution, it caused no symptoms in pigeons, but was a very active coagulant. This globulin fraction was treated with basic lead acetate to precipitate albumen, the precipitate removed by centrifuge, and the solution dialysed until free from lead; it was then concentrated by ultrafiltration to one-third of its original volume.

The chemical composition of the coagulating substance is not known. It cannot be said whether it is an albumen-derivative, or even whether it is free from nitrogen, as it has only been obtained in dilute solution, and mixed with a small amount of albumen; it is probable that it is an enzyme, a form of coagulase.

The authors suggest that its use should be tested in cases of severe haemorrhage and haemophilic conditions, and they offer to supply samples for this purpose.

H. J. Walton.

VON KLOBUSITZKY (D.) & KÖNIG (P.). Biochemische Studien ueber die Gifte der Schlangengattung Bothrops. IV. Mitteilung: Die Wirkung der gerinnungsfördernden Substanz in vivo. [**Biochemical Studies of the Venom of Bothrops. The Action of the Coagulating Principle in vivo.**]*—Arch. f. Experim. Path. u. Pharm.* 1936. Sept. 30. Vol. 182. No. 5. pp. 577–583. [16 refs.]

The authors refer to the work of HOUSSAY and SORDELLI (1919), who studied the changes in the coagulability of the blood in dogs and rabbits after intravenous and subcutaneous injection of snake venoms. They found that large doses (2 mgm. per 10 kgm. dog) quickly produced intravascular coagulation; with smaller doses (1 mgm. per 10 kgm. dog), after a temporary shortening of the coagulation time (positive phase), the fibrinogen is precipitated and the blood remains uncoagulable (negative phase).

The authors consider that, in these experiments, too large doses were given, and the times of observation were too short, for it to be

possible to draw any useful conclusions as regards the therapeutic use of the venom; they have therefore carried out experiments on pigeons with the coagulating substance isolated by them from the venom of *Bothrops jararaca*.

They had found previously that a solution of this substance, if entirely free from albumen, and salts, loses its activity very quickly, and so they used a solution containing 0.042 per cent. of dried matter, of which 0.0150 per cent. consisted of albumen. The strength of the solution was such that 1 cc. completely coagulated 5 cc. of oxalated blood of the horse in three minutes. Two series of experiments were made: in the first series blood was withdrawn and tested for coagulability 1 minute and 20 minutes after the injection; in the second series, after 20 minutes and 24 hours. The coagulating solution was used at different degrees of strength.

It was found that the result depended upon the time that had elapsed after the injection. Large doses diminish the coagulability at first; after 24 hours, the coagulability is increased. Small doses have no decided effect at first; but after 20 minutes they accelerate coagulation, and this result persists for at least 24 hours.

The authors estimate that in a pigeon weighing 350 gm. the volume of blood is 20 cc., and that the coagulating constituent of the venom is active in a dilution of 0.00000055 mgm. per cc. of the pigeon's blood. On the strength of these experiments on pigeons, and assuming that the total amount of blood in a man is 4.5 litres, they think that 0.0025 mgm. should be a suitable dose for therapeutic use in cases of haemorrhage and haemophilia.

H. J. Walton.

- v. KLOBUSITZKY (D.) & KÖNIG (P.). Ueber die Bindung der gerinnungsfördernden Substanz des Giftes der *Bothrops jararaca* durch Schlangenserum. [Neutralization of the Coagulating Substance of *Bothrops jararaca* Poison by Snake Sera.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1936. Nov. 3. Vol. 89. No. 3/4. pp. 145–160. [17 refs.]

The question whether the coagulant action of the *Bothrops* poison is caused by a specific substance or by the neurotoxic component may be considered settled in favour of there being two different component substances. It is not altogether clear, however, whether the neutralizing power of the antisera to snake poisons is strictly specific. As the authors had succeeded in separating from the crude poison of *Bothrops jararaca* a coagulating substance, it seemed worth while testing it for its serum specificity. It may be explained that the bushmaster (*Lachesis mutata*) and S. American rattlesnake (*Crotalus terrificus*) antisera combine quite non-specifically with the purified neurotoxic component of the *Bothrops* poison and, yet, the crude *Bothrops* poison is only neutralized by rattlesnake antisera to a very slight extent. The problem, therefore, to be solved was whether the neutralization of the purified coagulating substance was specific or, like the purified neurotoxin also, non-specific.

The coagulant substance was available in the form of very dilute, completely protein and biuret-free solutions obtained from the crude poison of *Bothrops jararaca* (former name *Lachesis lanceolatus*). Neutralization experiments were carried out with monovalent *Bothrops*-, rattlesnake-, and bushmaster-sera and with divalent coral snake-sera (*Micrurus frontalis* and *M. corallinus*).

The results of these tests may be summarized :—(1) Coagulating substance from *Bothrops jararaca* poison is neutralized equally by *jararaca* and bushmaster antisera. (2) The bivalent coral antisera and rattlesnake antisera have no combining action with this *Bothrops* coagulating substance. (3) The previous work on the immunological, and perhaps also chemical, identity of coagulating and neurotoxic substances may be combined, with the work now carried out, in the following table :—

Neurotoxic Substances		Coagulating Components.	
Identical with Bothrops toxin	Not identical with Bothrops toxin	Identical	Not identical
<i>B. jararaca</i> <i>Lachesis mutata</i> <i>Crotalus terrificus</i>	<i>Micrurus frontalis</i> <i>M. corallinus</i>	<i>B. jararaca</i> <i>L. mutata</i>	<i>C. terrificus</i> <i>M. corallinus</i>

W. F. Harvey.

HANUT (Charles Joseph). La coagulation *in vitro* du plasma par les venins des *Bothrops* dépendelle uniquement d'une action thrombinique ? [*Is Coagulation in vitro of Plasma by Bothrops Venom due solely to Thrombin ?*—*C. R. Soc. Biol.* 1936. Vol. 122. No. 22. pp. 796-798.

That *Bothrops* venom in quite small doses will coagulate the oxalated plasma of the rabbit and solution of fibrinogen is known and has been shown to be due to thrombin action ; but this may not be the only cause. The author examined for the presence of proserozyme by the method of adsorption with tricalcium phosphate, but found this unsuitable because the thrombin of the venom was strongly adsorbed by this substance. He therefore carried out the following procedure, using the venom of *B. atrox* :—

To 4 cc. of clear oxalated rabbit plasma are added 12 cc. physiological saline and 4 cc. of a 1 in 20 million dilution of the venom in saline. The mixture is placed in an incubator at 37°C. A clot forms in about an hour which on defibrination yields a clear liquid. This is returned to the incubator and a fresh clotting occurs. This procedure is repeated until the fluid obtained no longer clots, *i.e.*, the total duration in the incubator is 4 hours. In Pyrex tubes, 12 mm. diameter, are placed 0.4 cc. of the liquid so obtained and 0.35 cc. of physiological saline containing 1.05 gm. CaCl₂. After varying intervals 2 drops of a suspension of cytozyme and 3 minutes later 0.2 cc. of dioxalated plasma (as solution of fibrinogen) are added.

Coagulation after 30 seconds' to 2 minutes' contact is due to the venom thrombin. But "if the liquid contains only thrombin, after longer contact of 5 minutes or more the mixture ought still to coagulate in about 6 minutes ; but it clots in a much shorter time, 2 mins. 7 secs. to 3 mins. 22 secs. This can hardly be explained in any other way than by admitting that in the defibrination liquid there exists a proserozyme which, in the presence of calcium, is transformed into serozyme after an interval of 2-5 minutes." This is analogous to what occurs with a staphylocoagulase. The proserozyme was found similarly in the venom of *B. neuwiedi* and *B. alternata*, but not in that of *B. nummifera*.

H. H. S.

LINK (Th.). Der Einfluss der Schlangengifte auf die Blutgerinnung. 2. Mitteilung. *Crotalus terrificus*, *Bothrops jararacussu*. [The Action of Snake Poison on Coagulation of Blood.]-*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1937. May 27. Vol. 90. No. 4. pp. 352-357.

Following up his investigations on *Crotalus* venom the author has studied the action of the venom of *Crotalus terrificus* in inhibiting blood-clotting. He finds that this is brought about when large doses are used and is due to destruction of fibrinogen. In small doses, on the contrary, coagulation is promoted and is best demonstrated by adding oxalated blood to the venom. He tested in a similar way the venom of another South American snake, *Bothrops jararacussu*, and found it to act in the same way—large doses inhibiting, small promoting, clotting. Both factors in the case of the *Bothrops* are neutralized by the antivenene. If the venom of *B. jararacussu* is heated to 70°C. for a quarter of an hour, the thermostable inhibiting constituent can be separated from the thermolabile coagulant factor, but compared with the unheated venom the toxicity is reduced to one-tenth.

H. H. S.

VELLARD (Jehan). Variations géographiques du venin de *Bothrops atrox* L. [Geographical Variations in the Venom of *Bothrops atrox*.]-*C. R. Acad. Sci.* 1937. May 3. Vol. 204. No. 18. pp. 1369-1371.

Variations in venom potency are of three kinds: individual, seasonal and geographical. The author in this paper deals only with the last. He chose *Bothrops atrox* because of its wide distribution and compared the venom from specimens in Venezuela, Martinique, Northern Brazil and Costa Rica.

The Venezuelan strains were distinguished by their coagulant and haemolytic properties, whereas the proteolytic, anti-complementary and anticoagulant actions were weak. *In vivo*, their toxicity was great, but the haemorrhagic oedema produced did not as a rule go on to necrosis.

Martinique strains (*fer de lance*) were nearly equal to those of Brazil in proteolytic power, but their coagulant action was small, and haemolytic a little below that of the Venezuelan strains. *In vivo*, they evince a marked neurotropic action and severe local necrosis.

That of Costa Rica has but slight proteolytic and haemolytic action; its coagulant and toxic effects approximate those of the Venezuelan strains. *In vivo* extensive haemorrhagic oedema is seen, but seldom necrosis.

The above findings indicate the advisability of preparing antivenenes peculiar to the country in which they are likely to be needed.

H. H. S.

NAGAMITU (Gun'itirô). Experimentelle Untersuchung ueber das Ancistrotongift [Study of the Venom of *Ancistrodon*.]-*Okayama-Igakkaï-Zasshi* (Mitt. d. Med. Gesellsch. z. Okayama). 1936. July. Vol. 48. No. 7. [In Japanese pp. 1650-1657. With 6 charts. German summary p. 1650.]

The venom of *Ancistrodon blomhoffii* was investigated. Its chief action on the rabbit was to depress the respiratory centre, and death

was due to paralysis of this centre. Its nerve action was tested on the frog. It did not affect the nerves or motor-end plates, nor the skeletal muscles; no evidence was obtained of any haemolytic action.

H. H. S.

TOMOYAMA (Kazuo). **On the Influence of Formosan Principal Snake Venoms upon the Rate of Sedimentation of the Erythrocytes of Normal Rabbits.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Aug. Vol. 35. No. 8 (377). [In Japanese pp. 1627–1644. [33 refs.]. English summary pp. 1644–1645.]

The venoms investigated were those of *Ancistrodon acutus*, *Trimeresurus macrosquamatus*, *T. gramineus*, *Naja naja atra* and *Bungarus multicinctus*. The venoms were injected into the marginal ear vein of healthy adult rabbits, 15 male and 25 female [dose of venom injected is not stated] and the sedimentation rate determined 5 minutes before and one hour, one hour, one and a half and two hours afterwards. In the tables readings are given after 1, 2, 3, and 24 hours, so only general conclusions can be stated:—

1. Individual animals differed from one another, but this seemed to bear no relation to sex. [According to the tables the minima were lower and the maxima higher in females than in males, but the averages were lower in the females.]

2. The haemorrhagic venoms of *A. acutus* and *T. macrosquamatus* caused slowing of the sedimentation rate after half and one hour, but at 1½ and 2 hours there was acceleration. That of *T. gramineus* caused retardation between ½ and 2 hours.

3. The neurotropic venoms of *N. naja* and *B. multicinctus* were followed by slight degree of acceleration at 1½ and 2 hours, no difference from the normal being observed at the shorter periods of ½ and 1 hour.

4. The haemorrhagic and neurotropic venoms could be differentiated by the sedimentation rates after ½ and 1 hour.

5. The retardation or acceleration of the rate appears to be closely connected with increase or decrease in the total number of erythrocytes.

H. H. S.

OH (Jintetsu). Ueber die Wirkung des Giftes gewisser formosanischer Schlangen auf das Schmerzzentrum. [**The Action of Certain Formosan Snake Venoms on the Pain Centre.**]—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1936. Sept. Vol. 35. No. 9 (378). [In Japanese pp. 2083–2090. [18 refs.]. German summary pp. 2090–2091.]

The author's experiments aimed at determining whether certain snake venoms affected the pain centre and, if so, in what doses they acted. Okushima's method was employed, the venoms being dried over sulphuric acid and then dissolved in physiological saline. The venom was injected subcutaneously in the back of mice and the pain response tested by a needle-prick in the tail. The following venoms were tested: *Trimeresurus macrosquamatus*, *T. gramineus*, *Ancistrodon acutus*, *Naja naja atra* and *Bungarus multicinctus*.

The venoms of the *Trimeresurus* species in a dose of 0.001 mgm. per gm. body weight had no effect on the pain centre, but in doses of 0.005 mgm. susceptibility to pain was impeded, whereas that of *Ancistrodon acutus*, even up to 0.01 mgm. (the minimum lethal dose) had no effect.

Of the Elapinae; the venom of *Naja atra* in doses of 0.00001 mgm. per gm. very slightly reduced susceptibility to pain; with 0.00005 mgm. it was quite obvious and with twice this dose very marked and even more with 0.0005 mgm., the minimum lethal dose. With that of *Bungarus multicinctus*, 0.00001 mgm. had a slight action, 0.00005 very distinct and the effect was more and more marked up to the m.l.d. of 0.0003 mgm.

Briefly, the Elapine venoms had a definite and fairly rapid action in reducing susceptibility, whereas the Crotaline had little or none even when the dose approached the corresponding minimum lethal dose.

H. H. S.

OH (Jintetsu). Ueber die Wirkung des Giftes gewisser formosanischer Schlangen auf die motorischen und sensiblen peripheren Nerven. [The Action of Certain Formosan Snake Venoms on the Motor and Sensory Nerve-Endings.]—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1936. Sept. Vol. 35. No. 9 (378). [In Japanese pp. 2092–2099. [16 refs.] German summary pp. 2099–2100.]

The same venoms as above were tested by the Santesson-Osaki method, with the frog as the experimental animal, the venom being dried and then dissolved in Ringer's fluid.

It was found that the Crotaline poisons, those of *T. mucrosquamatus*, *T. gramineus*, and *A. acutus*, paralyse the sensory nerves much more rapidly than the motor, and that of *T. gramineus* was the most potent, *T. mucrosquamatus* next, and *Ancistrodon acutus* the least. The venoms of the Elapine snakes, *M. n. atra* and *B. multicinctus* act on both sensory and motor endings, paralysing them fairly quickly; that of *Bungarus* was more potent than that of *Naja* and both were more active in this respect than any of the Crotalines. H. H. S.

BARROS (Evandro Fonseca). Contribuição ao conhecimento da hyper-sensibilidade ao veneno ophidico. [Hypersensitivity to Snake Poison.]—*Brasil-Medico*. 1936. Mar. 21. Vol. 50. No. 12. pp. 243–246. English summary.

The author refers to previously recorded cases, one of which, for example, was evidenced by a generalized dermatitis, the patient having been bitten by a rattlesnake on a former occasion. He records two more in this article. Both had been in the habit of handling snake-venom, in dried or liquid form, for about two years. The first was actually bitten by a rattlesnake when he was trying to extract its venom, the second was not bitten but the symptoms of hypersensitivity were similar in both. These symptoms were violent sneezing when handling the venom, or even coming near it (one sneezed 75 times in succession), followed by thirst and sweating; there might be rhinorrhoea, dyspnoea, cough and a considerable amount of expectoration. These lasted for 1–2 days at first, but later might persist for 5 days after a single exposure, such as a vial being opened in their presence. They became so sensitive that an attack would come on if they entered a room in which a vial had been opened, or through which it had been taken, two hours before. Attempts at

desensitization by application of very dilute solutions of the venom to the nasal mucosa have proved unavailing.

Two others working in the author's laboratory are now showing signs of sensitivity—an attack of sneezing and rhinorrhoea when standing for some time near an open vial.

H. H. S.

SEILER (Johannes). Versuche zur Schmerzbekämpfung mit Kobragift. [**Cobra Venom as an Analgesic.**].—*Muench. Med. Woch.* 1936. Mar. 27. Vol. 83. No. 13. pp. 527–528.

The author sought to confirm or refute some results reported lately from the Calmette Institute. (He gives the following references to papers describing them:—*C. r. Acad. Sci.*, Vol. 197, No. 3 of 17/7/33; MONAELESSER and TAGUET, *Bull. Acad. Méd.*, Vol. 109, No. 11, séance du 14/3/33; PITON, *Presse Méd.*, 1934, No. 2).

In these papers it was stated that:—

1. In experimental carcinoma of mice, injections of cobra venom caused involution in some of these animals.

2. Cobra venom appeared to have an inhibitive action on tissue cultures.

3. The author quotes CALMETTE's personal experience of an accidental bite of a cobra, which caused extensive anaesthesia which only disappeared after antivenene treatment.

4. MONAELESSER found that cobra venom stopped the painful neuralgias of lepers.

5. MONAELESSER and TAGUET tried the effect of the venom on 115 cancerous patients with favourable results. They believe that, besides a decided diminution of the pain, there was in certain cases improvement in the condition of the tumour, and decrease in the cachexia. ORTICONI and RAVINA report that "inoperable" cases often improved and became fit for operation. But, in general, diminution of pain was the most important result of the treatment.

The author used a solution of dried cobra venom in physiological salt solution. In healthy people he found that, although the actual injection caused no appreciable pain, a painful induration occurred at the seat of injection. He tested the treatment on a patient with very severe sciatica, on another with pain in the leg due to arterio-sclerosis, on two patients with bronchial carcinoma and pain in the arms, and on a man with carcinoma of the prostate and pain in the leg. The patients all had some initial pain following the injection; in some cases this was severe and it usually lasted for 24 hours. After one injection, two patients refused further treatment on this account; two others, who had each received four injections, had more and more pain after each injection, and the treatment had to be abandoned. The only patient who had no increase of pain was the one with arteriosclerotic pains in the leg; in his case a sudden arterial block necessitated amputation.

The author's results entirely failed to confirm the French reports, and he is unable to explain the lack of agreement. He suggests that possibly the cobra venom used was not pure, and may have contained some organic extract, as described in PITON's paper.

H. J. Walton.

KIRSCHEN (Martin). Ueber das Kobratoxin und seine therapeutische Verwendung. [*The Therapeutic Uses of Cobra Venom.*]—*Wien. Klin. Woch.* 1936. May 22. Vol. 49. No. 21. pp. 648–651.

The author refers to the results obtained by MONAELESSER and TAGUET, SAENCE and COSTIL, who found that cobra venom had a curative effect on both transplanted and spontaneous carcinoma in mice, and that one-tenth of the minimal lethal dose injected into the tumour of the mouse caused it to disappear permanently. Other observers (LAIGNEL-LAVASTINE, PASQUALINI, MUFFRE, BOER and others) reported improvement in the condition of inoperable carcinomas in human subjects, or, at least, improvement in their general condition.

These results induced the author to try the effect of cobra venom on painful cases of inoperable and recurrent carcinoma; he also tested the anodyne effect of the treatment on cases of neuralgia and neuritis. He used a colloidal solution of standardized venom, free from bacteria, haemorrhagin and haemolysin, supplied by the Dumatras laboratory of Paris.

The optimum for each patient must be found by experiment. He began with small doses, given subcutaneously in the upper part of the back or in the gluteal region, repeated at intervals of three days; he did not try injections directly into or in the neighbourhood of the tumours. If the dose was too small, there was little, or only a temporary effect; if too high, there was increase of pain and general symptoms. Often, with small doses, the pain diminished and the patient felt better; in such cases the same dose was continued, and the intervals between the injections lengthened. If no result followed after four or five injections, the dose was increased.

The author treated 23 cases; of these 15 were patients with cancer of the stomach, 3 of the lungs, 3 of the intestines, and 2 of the mammary gland.

Of the 10 cases of inoperable cancer of the stomach, five were unaffected by the treatment; in three other cases, there was a decided temporary improvement. Thus, a man aged 60, after three weeks' treatment had lost all pain, and gained 7 kilograms in weight; the blood, which showed marked anaemia at first, improved very much. The improvement lasted for two years, after which the man began to lose weight, and his condition deteriorated.

A woman aged 57, with inoperable carcinoma of the stomach, began treatment in October 1933. She improved rapidly, gained 6 kilos in weight, lost all pain, and feels well now. Another man, aged 64 years, improved considerably for 6 months, had no more pain, and gained weight; after that he had a relapse and died. Two other patients improved, lost pain, gained weight, and continued for some time to feel well. In five patients with gastric carcinoma, who had undergone operation, cobra toxin caused diminution of pain in four, and a very decided temporary improvement in the fifth. Two cases of bronchial carcinoma were unaffected by the treatment; the third case was favourably influenced as regards pain.

The results in three cases of intestinal cancer were good; pain and tenesmus were much lessened; in one case, very decided improvement lasted for a year.

In two cases of mammary carcinoma, with metastatic growths after operation, the pain was much diminished; the patients, however,

were undergoing intensive X-ray treatment at the same time as the injections, and it is impossible to say to which treatment the favourable result was due. The author draws the following conclusions :—

Cobra toxin appears to have no specific effect on carcinoma in man. In his series of cases there was no real cure, and no disappearance or even diminution in size of the tumour, such as French observers have reported, and such as might be expected from experiments on animals. There is no doubt that cobra venom is a strong analgesic, which can replace morphia. At present it is impossible to say to which constituent of the venom this effect is to be attributed. The decided analgesic effect is of great importance, for the venom acts efficiently in the case of the usually cachectic and undernourished patients, without, as morphia does, destroying their appetite and weakening their defensive resistance to the disease.

The price of the original preparation is high, but recently a satisfactory and cheaper one has been produced at the Vienna Serotherapeutic Institute.

Lately the author has used cobra venom treatment for patients with neuralgia and neuritis of varied origin, and he has observed a well-marked analgesic effect. Seven cases, of which two were of severe sciatica, were quickly relieved of pain.

H. J. Walton.

KIRSCHEN (Martin). Ueber das Kobratoxin und seine therapeutische Verwendung. [**The Therapeutic Application of Cobra Venom.**]—*Mitt. d. Volksgesundheitsamtes.* 1936. Dec. 1. No. 12. pp. 313-316.

The analgesic properties of cobra venom are becoming widely known. The author refers to 23 cases of carcinoma and several of severe neuralgia so treated, many with good effect. Among the former were 15 of carcinoma of the stomach, 10 of them in an inoperable stage. Three of the last are detailed; they lost the pain and appetite improved. Of the other seven, two showed distinct improvement, losing pain, gaining weight and feeling generally better, five remained unaffected. In those operated upon, the pain was much lessened. Other cases included 3 of malignant disease of the lungs, 3 of the rectum and 2 of the breast. The rectal cases showed great relief of the tenesmus as well as of pain.

Of the non-malignant patients 7 suffered from severe sciatica and relief was obtained "in a relatively short time." The dose to be given varies and the optimum has to be determined for each patient [see previous summary and also this *Bulletin*, 1936, Vol. 33, p. 396].

H. H. S.

ROLDÁN (Amalio). La venenoterapia en el cancer. Sus fundamentos y aplicaciones actuales. [**The Effect of Snake Venoms in Cancer.**]—*Bol. Asoc. Med. de Puerto Rico.* 1936. Feb. Vol. 28. No. 2. pp. 32-36.

Among remarks of a general nature concerning snake bite and venoms the following are of special interest to readers of this *Bulletin*. The use of cobra venom in a strength of 1 in 80,000 in 8 cases to relieve the pain of cancer of the throat, involving pharynx and larynx, which, as is well known, is one of the most painful sites of the carcinoma, was followed by marked relief of the pain in six of them; in one no change was observed, while in the last "not only did the pain cease, but the tumour disappeared completely." Dr. KORBLER of Zagreb

employed Poskok venom (*Vipera ammodytes*) in doses of 5–10 rat units in 26 cancer cases; the pain was relieved in all and in some modification in the growth was observed. It seemed also to bring about improvement in the general state. The same venom was used with success in the relief of pain due to neuralgia, to rheumatism and arthritis deformans [see also this *Bulletin*, 1936, Vol. 33, p. 396.]

H. H. S.

BRÜNNER-ORNSTEIN (Martha). Behandlungsversuche mit Kobratoxin bei neurologischen Erkrankungen. [**Cobra Venom in the Treatment of Neurological Affections.**—*Wien. Klin. Woch.* 1937. Jan. 29. Vol. 50. No. 4. pp. 127–128.]

The author employs two strengths of the venom, one used in an initial dose of 0.0001 cc. standardized to 4 mouse-units, the other 0.0005 cc. or 20 mouse-units per cc. One cc. of the former contains 0.1 mgm. of the cobra venom. He records very gratifying results in cases of obstinate trigeminal neuralgia, relief being speedily attained (perhaps in half an hour). Of fourteen cases of very severe neuralgia six have been free of pain for 3–4 months, four are distinctly better. The author tried *Crotalus* venom in some cases, and though benefit resulted, it was less marked than with cobra venom. Good effects have been obtained in rheumatic conditions and the author proposes to try the treatment in other cases of neuralgia and neuritis and also for the pains of tabetic crises. [Dr. Burgess BARNETT in a personal communication to the reviewer states that he has obtained excellent results in a case of tabes, the crises having ceased for 8 months.]

H. H. S.

FINKELMAN (Isidore). **Snake Venom (Moccasin) in the Treatment of Epilepsy.**—*Jl. Lab. & Clin. Med.* 1937. Mar. Vol. 22. No. 6. pp. 572–575. [12 refs.]

The idea of employing snake venom for treatment of epilepsy arose from an alleged freedom from attacks in epileptics after they had been bitten by snakes. SPLANGLER used *Ancistrodon* venom and reported favourable results, explaining them by the decreased rate of coagulation caused by the venoms. Later, he seems to have abandoned this theory but found the treatment useful in those who reacted by an eosinophilia. Contradictory reports thereafter appeared, and the author has tried it on eight epileptics; he used Moccasin-Mulford venom 1:3,000, starting with 0.2 cc. intradermally and increasing twice weekly by 0.2 cc. to a maximum dose of 1.0 cc., and then at weekly intervals.

The patients' records were carefully studied as to previous frequency of convulsions both under luminal and without treatment. Use of venom alone was followed by increase in frequency and severity of convulsions and luminal had to be re-started. The patients became also more irritable. The author concludes that at all events in institutional epileptics (who show mental deterioration and usually have organic brain changes more marked than extramural cases) venom therapy not only does not render them refractory, but, also on the contrary, rather more susceptible to convulsive seizures.

H. H. S.

v. KLOBUSITZKY (D.). Schlangengifte in der Therapie. [**Therapeutic Uses of Snake Venom.**]—*Klin. Woch.* 1937. Apr. 17. Vol. 16. No. 16. pp. 569–575. [87 refs.]

This article is brought to the notice of readers because it comprises an excellent summary of a difficult subject—the various uses to which different snake venoms have been put in the treatment of disease. Being itself a summary, it cannot be abstracted; it should be read by all interested. Venoms of many species are dealt with, Colubrids, Crotalines, Viperines and their employment in malignant tumour patients, in neuralgia, rheumatic conditions, epilepsy, haemorrhagic diseases and others. A large number of references is appended, the ample documentation greatly facilitating further study. *H. H. S.*

EAGLE (Harry). **The Coagulation of Blood by Snake Venoms and its Physiologic Significance.**—*Jl. Experim. Med.* 1937. May 1. Vol. 65. No. 5. pp. 613–639. With 5 figs. [23 refs.]

This article treats the subject of snake venoms and their haemostatic action from the physiological aspect, but as the empiric use of these venoms in clinical practice is becoming more extensive this empiricism must give way before the scientific determination of their mode of action. The physiological determination is essential to their rational employment, hence the value of this article. The following were the venoms tested: *Ancistrodon piscivorus*, *Bitis arietans*, *Bothrops atrox*, *B. jararaca*, *B. nummifera*, *Crotalus adamanteus*, *C. atrox*, *C. horridus*, *C. terrificus basiliscus*, *C. terrificus terrificus*, *Micrurus* mixed, *Naia flava*, *N. naia*, *Notechis scutatus*, *Sepedon haemachates*, *Vipera ammodytes* and *V. russelli*.

The results are summarized in the author's words as follows:—

"Nine of the 17 venoms here tested were found capable of coagulating citrated blood or plasma. As has been believed by most workers in the field, 7 of these 9 coagulant venoms convert fibrinogen to an insoluble modification resembling fibrin (*Bothrops atrox*, *Bothrops jararaca*, *Bothrops nummifera*, *Crotalus adamanteus*, *Crotalus horridus*, *Crotalus terrificus basiliscus*, *Crotalus terrificus terrificus*). The optimum pH for this coagulation was determined for 3 of these, and was found in each case to be approximately pH 6.5, the same as that for the action of thrombin on fibrinogen. Unlike thrombin, however, the fibrinogen-coagulating activity of the venoms was unaffected by the antithrombin elaborated in the course of anaphylactic shock.

"In addition to coagulating fibrinogen directly, 3 of these venoms (*Bothrops atrox*, *Bothrops jararaca*, and to a less extent, *Crotalus terrificus basiliscus*) acted on prothrombin to convert it to thrombin, without the necessary intervention of either calcium or platelets. Finally, 2 venoms (*Notechis scutatus*, and to a slight extent, a mixed *Micrurus* venom), which had no demonstrable effect on purified fibrinogen, nevertheless converted prothrombin to thrombin.

"Unlike the reaction between the venoms and fibrinogen, this activation of prothrombin has no definite pH optimum, but takes place over a wide zone (pH 5.6–8.3). In the case of *Bothrops atrox*, there was some indication that the initial velocity of the reaction increased with increasing alkalinity, but that the amount of thrombin ultimately formed decreased. Extraordinarily minute quantities of some of these venoms sufficed to produce a demonstrable activation of prothrombin. Thus, the fer de lance (*Bothrops atrox*) venom was active in a 1:25,000,000 dilution, and that of the Australian tiger snake (*Notechis scutatus*) was active in a 1:4,000,000 dilution.

"The thrombin formed was indistinguishable from that produced by the action of calcium + platelets on prothrombin. Like the latter type of thrombin, and unlike venoms which act directly on fibrinogen, thrombin formed from prothrombin by venom was inhibited by antithrombin.

"Every one of the 9 non-coagulant venoms in this series destroyed prothrombin; and 5 of these destroyed fibrinogen as well. As is discussed in the text, there is reason to believe that these several properties of the venoms (coagulation and destruction of fibrinogen; activation and destruction of prothrombin) depend on the proteolytic enzymes which they were found to contain.

"These observations lend further support to the thesis that, in the course of physiological coagulation, (a) calcium plus platelets (or tissue derivative) constitute an enzyme system which reacts with prothrombin to form thrombin, and which is thus analogous to trypsin and to several of the proteolytic venoms here discussed, and (b) the thrombin so formed is itself a proteolytic enzyme which, like papain and the majority of the coagulant and proteolytic snake venoms here studied, reacts with fibrinogen to form a fibrillar gel, fibrin."

H. H. S.

HIGGINS (Lionel) & THORNE (R. Thorne). **Epistaxis treated with Viper Venom.** [Memoranda.]—*Brit. Med. Jl.* 1936. Mar. 28. p. 640.

The authors record the case of a man of 63 years with a severe epistaxis. Repeated plugging of the nares and injections of so-called haemostatic serum, and of hazeline and adrenaline locally during 6 days proved ineffectual. There was a history of a severe bleeding on a previous occasion after tooth extraction and a brother was believed to be haemophilic. Viper venom [presumably *V. russelli*] was obtained and the nares plugged lightly with gauze soaked in it [strength not stated, but as it was obtained from the Wellcome Research Laboratory, it was probably 1 in 10,000, as is usual]. Haemorrhage ceased at once and had not recurred in the 3 weeks which had elapsed when the case was reported.

H. H. S.

HYATT (J. W.) & BUCKLAND (F. E.). **A Case of Severe Epistaxis and Recovery following the Use of Daboia Venom as a Haemostatic.**—*Jl. Roy. Army Med. Corps.* 1937. Jan. Vol. 68. No. 1. pp. 54-55.

V. russelli venom has been used with good results in several cases of haemophilia, but the case recorded by the authors is of interest because of the venom being used for obstinate and prolonged haemorrhage following trauma; there is no mention of any haemophilic taint.

The patient was a driver in the Royal Artillery with a history of epistaxis for six days following a blow with a cricket ball. Morphine, plugging the anterior nares with adrenalin gauze, the use of serum, had all proved ineffectual as haemostatics. His condition was serious when transported to hospital, a journey of 18 miles. Haemorrhage continued in spite of plugging of the posterior nares. Daboia venom, 1 in 10,000 dilution, was applied on an anterior plug, but bleeding continued behind it. Anterior and posterior plugging next morning with gauze soaked in the venom proved successful. By this time the pulse was 130 per minute, he was very blanched and respirations were

only 9 per minute. Convalescence was rapid and uninterrupted. The venom used was a preparation of the Kasauli Research Institute, a 1 in 10,000 dilution sterilized by filtration, and with 50 per cent. glycerin. Each 2 cc. ampoule contained 0.2 mgm. venom. Its coagulant activity had been retained for at least a year.

H. H. S.

RAIMONDI (Alejandro A.) & SANGIOVANNI (Adolfo). Tratamiento de las hemoptisis por el veneno de la *Vipera russellii*. [**Daboia Venom in Haemoptysis.**—*Prensa Méd. Argentina*. 1937. Jan. 6. Vol. 24. No. 1. pp. 42-46.]

The strength of the solution utilized by the authors was 0.05 mgm. per cc., 1 cc. containing ten mouse-units (*i.e.*, 0.1 cc. was lethal for a mouse). They divided their patients into three groups, giving to one 0.25 cc., to the second 0.5 cc., and to the third 1.0 cc., and noted the coagulation and the bleeding time $\frac{1}{2}$, $\frac{1}{2}$, 1, 2, 4 and 24 hours afterwards. The groups were very small, five in each of the second and third and two only in the first. Brief notes are recorded of nine of the patients. So far as general conclusions can be drawn on such a few cases, the authors found that the coagulant effect of the *V. russellii* venom was observed in a few minutes and increased up to two hours, beginning to return to normal after four hours; also that the intensity of the reaction was proportional to the quantity of venom injected, and, finally, that a dose of 0.05 mgm. could be repeated 4-hourly without danger.

H. H. S.

BARRATT (A.). **Haematemesis treated with Snake (Russell Viper) Venom by Mouth.** [Clinical Memoranda.]—*Brit. Med. Jl.* 1936. Nov. 28. p. 1083.

The patient was a thin, frail woman of 80 years who had suffered intermittently for the past 30 years from epigastric pain and vomiting; 22 years ago she "had a profuse haemoptysis" [? haematemesis]. In July of the present year (1936) her systolic blood pressure was 275 mm. On the 19th she vomited $1\frac{1}{2}$ -2 pints of blood, and this symptom continued in spite of rest in bed, and injection of morphine. In 24 hours she lost over 4 pints of blood. In view of her high blood pressure the haemorrhage was not at first regarded very seriously, but its persistence and amount were causing alarm and anxiety. The author had at hand some of Burroughs Wellcome & Co's "stypven," a *Daboia* snake venom product. He gave the contents of one phial of this by mouth. "There was no further haemoptysis" [again? haematemesis]. A month later the blood pressure was 160/80 and $3\frac{1}{2}$ months after the attack is the note "patient now fully recovered." Of course, haematemesis does cease spontaneously, particularly when an associated high blood pressure falls, but in this case the sequence was very prompt. A second point worthy of note is that no untoward symptoms arose ascribable to the action of absorbed venom. [Stypven is a preparation for local application of a strength of 0.1 mgm. dried venom per cc. On dilution it is said rapidly to lose its efficacy.]

H. H. S.

HANCE (J. B.). **Experience with Russell's Viper Venom.**—*Indian Med. Gaz.* 1937. Feb. Vol. 72. No. 2. pp. 76–78.

Three cases are recorded and the venom was administered in three different ways. The first patient was a man of 48 years operated upon for infected tonsils by tonsillectomy. He stated that he was a "bleeder" and his coagulation time was found to be six minutes. Bleeding of an oozing type followed the operation and was not stopped by continued pressure or suture of the pillars. Local application of pledgets soaked in Daboia venom, 1 in 10,000, was followed at once by cessation of haemorrhage.

The second was a woman of 36 years operated upon for hysterectomy. Five hours later there had been copious haemorrhage and the patient's condition was desperate. 0.5 cc. of 1 in 100,000 solution of the venom was injected intravenously and repeated in 10 minutes.

The third was a man of 68 years having a cholecystectomy for gall-stones; three weeks prior to operation his coagulation time was 9 minutes 20 seconds and he owned to free bleeding from slight injuries in the past; by calcium therapy this was reduced to $6\frac{1}{2}$ minutes and with haemoplastin to 6 minutes, but not less. Half an hour before operation 0.5 cc. of 1 in 100,000 dilution of the venom was injected intradermally, and at the start of operation the coagulation time was $4\frac{1}{2}$ minutes. After his operation and on his return to bed the coagulation time was $5\frac{1}{2}$ minutes and another intradermal injection was given. There were no complications.

It is thus seen that the venom was given by direct local application in the first case, intravenously in the second, and intradermally in the third. Burroughs Wellcome & Co's preparation, Stypven, was used for all.

H. H. S.

HANUT (Charles Joseph). *Recherches préliminaires sur l'emploi des solutions diluées de venin de Bothrops atrox comme hémostatiques.* [**Preliminary Study on the Employment of Dilute Bothrops Venom as an Haemostatic.**—*C. R. Soc. Biol.* 1936. Vol. 123. No. 36. pp. 1232–1234.

The author's method of testing *in vivo* the coagulant powers of the venom *Bothrops atrox* is as follows: From a rabbit weighing about 2 kgm. is taken 4 cc. of carotid blood in 0.4 cc. of a mixture of sodium chloride and oxalate (NaCl 600 mgm., Na oxalate 1 gm. water (twice distilled) 100 cc.) Clear plasma is obtained by centrifuging and to 0.2 cc. is added 0.8 cc. physiological saline containing 1 gm. 50 mgm CaCl_2 to the litre and the time of coagulation noted. Next, 1 cc. of varying concentrations of *B. atrox* venom is injected into the jugular, and at intervals of 10, 30, 60 minutes, and then hourly, samples are taken and treated as detailed above. For example, after injection of a 1 in 500,000 dilution the oxalated plasma from the blood withdrawn coagulates 10–30 minutes later without any added calcium. On the other hand, 60 minutes or more after, the blood remains incoagulable even if calcium be added. The former is due to the action of the venom on the fibrinogen, and the secondary incoagulability is due to the defibrination.

It would seem that this secondary incoagulability would be an argument against the use of this venom as a haemostatic, but this

secondary effect was not observed if dilutions of 1 in 2,000,000 or more were used and even 1 in 5 to 10 million suffice and retain their coagulant properties, and moreover are non-toxic. *H. H. S.*

HANUT (Charles Joseph). Recherches préliminaires sur l'emploi, comme hémostatiques, des mélanges de venin de *Bothrops atrox* et de sérum antiothropique. [**On the Use of Mixtures of Bothrops Venom and Antivenene as Haemostatics.**].—*C. R. Soc. Biol.* 1936. Vol. 123. No. 36. pp. 1234-1235.

The author has found that in the rabbit the smallest amount of antivenene which will counteract the toxic effect of the venom of *Bothrops atrox* and that which will prevent its coagulant action *in vitro* are about the same; secondly, that the employment of a serum more powerful than is needed to prevent the toxic action of the venom does not affect the coagulant action *in vivo*. Thus, a mixture is prepared of venom 1 in 70,000, 1 cc. per kgm. body weight, and varying amounts of antivenene, 20 minutes before injection into the jugular vein of the rabbit. With 0.006 cc. of antivenene the animal lived for 3-5 hours, the coagulant action was marked, the secondary phase of incoagulability might or might not occur (see above abstract); with 0.06 cc. the animal survived for 24 hours, the coagulant effect was obvious but no secondary incoagulability, and the same held good with 0.1 and 0.3 cc. of the antivenene. The smallest amount needed, therefore, to counteract the toxic effects was between 0.006 and 0.06 cc. The absence of the secondary phase was proved in the way described above. *H. H. S.*

REVIEWS AND NOTICES.

CHESTERMAN (Clement C.) [O.B.E., M.D.(Lond.), M.R.C.P., D.T.M. & H.(Camb.), etc.]. **Tropical Dispensary Handbook. An Aid to the Training and Practice of Native Medical Assistants and for the Guidance of all engaged in Medical Practice in Rural Dispensaries in the Tropics.**—Third Edition. Revised and Enlarged. pp. xv+299. With 19 plates. 1937. London: United Society for Christian Literature, 4 Bouverie Street, E.C.4. [7s. 6d.]

To quote the author's preface "This Handbook was originally compiled in 1928 from notes of lectures given to a class of African Medical Assistants." In this, the third edition, its scope has been extended in order to make it useful to workers elsewhere in the tropics. The subject matter is divided into four sections:—Medical diseases, tropical and others: Surgical diseases: A list of the more commonly used drugs, their action, dose, etc. and more important preparations: Laboratory notes.

As Dr. Andrew BALFOUR remarked in a Foreword to the first edition—"Within a comparatively small compass he [the author] has succeeded in bringing together a great deal of useful, accurate and up-to-date information on a variety of subjects There can be no doubt that this Handbook will prove of value to those for whom it is intended, although possibly it may be regarded as somewhat advanced for their immediate needs." That its value has now been proved is demonstrated by the issue of a third edition; that some of its contents are somewhat advanced is true. The method of presentation follows that adopted in TIDY's Synopsis of Medicine. TIDY presupposes a general knowledge of medicine on the part of his reader, Dr. Chesterman only some knowledge of anatomy and physiology, but it would seem doubtful if a Native Medical Assistant would *understand* the text of the Tropical Dispensary Handbook without having previously attended systematic lectures and clinical demonstrations. While all credit is due to the compiler of this volume there are a number of points which call for criticism, which could be easily corrected in a subsequent edition.

Phraseological abbreviation is made use of freely but sometimes with a sacrifice of clearness or truth, thus pernicious anaemia is covered by a single paragraph—"It is necessary only to mention this disease as a possible cause of anaemia, in adults only. It is severe anaemia caused by the lack of proper *formation* of red cells which may be *reduced* to under one million per mm³. [reviewer's italics]. Probably this is due to a defect in gastric secretion. It results in the bone marrow sending out many immature cells into the circulation. Besides the symptoms of anaemia, there may be soreness of the tongue, and probably septic teeth. Nerve symptoms, paralysis, etc., may develop later."

There is evidence throughout of hurried preparation and lack of precision in writing—"Varicocoele [*sic*] is a condition *due* to enlarged and congested veins of the cord and *testis*." "Hydrocele is a *swelling of the membranes* (tunica vaginalis) surrounding the testis, with a clear fluid." "Epididymitis consists of inflammation of the epididymis or collecting tubules of the seminal fluid." "Boils. Signs and Symptoms. *They* may be *single*, or multiple, and may appear in crops." Nearly every page contains some similar example of careless phraseology.

Here and there important omissions occur ; thus in Tick Fever no mention is made of the pulmonary symptoms and irido-cyclitis in that disease. The geographical distribution of *Ternidens deminutus* is given as S. Africa only, etc.

Treatment, on the whole, is excellently described, but even greater detail might with advantage have been given in some cases.

H. S. Stannus.

GARNIRON (René). **Conservation des oeufs de quelques nématodes dans les fèces. Cas particulier d'Alger.** [Conservation of Nematode Eggs in Faeces with regard to Algerian Conditions.]—Thèse de Laboratoire de Parasitologie de la Faculté de Médecine d'Alger. Thèse No. 14. 160 pp. [Bibliography.] 1936. Algiers.

After ten main dedications this degree thesis passes on to a consideration of the literature dealing with the conditions suited to development of the eggs of hookworms, trichuris and ascaris. These are taken up under the headings of temperature, humidity, gases, culture media, urine and faeces, bacteria, acidity, chemicals, salt and sea water. After this the writer passes on to experiments of his own, cut short by the date on which the thesis had to be sent in. Development in cultures moistened with sea water was markedly slower than in fresh water, for when in the latter larvae were fully formed and active, in the former the outline of a larva had only just become visible. The practical points are that the sewers of Algiers discharge into the sea, that solid matter from them collects on the beach, and that sea water is used for road watering. Carriage of infection by air is accepted and the risk is pointed out of ascaris eggs being inhaled in dust from dried roads and elsewhere, or being eaten in sea dainties, among which are included oysters.

Clayton Lane.

SCHMIDT (Hans) & PETER (F. M.). **Ergebnisse und Fortschritte der Antimontherapie.** [Results and Progress of Antimony Therapy.]—218 pp. With 8 figs. 1937. Leipzig : Georg Thieme, Verlag. [Bound M.17 ; Unbound M.15.50.]

Though the native sulphide of antimony was known to classical writers it was not till the later Middle Ages that the therapeutic possibilities of antimony were explored by the somewhat mythical Basil-Valentine and by Paracelsus and his followers. The chemotherapeutic use of antimony dates only from the present century when Plimmer and Thompson in 1907 showed that antimonyl tartrates possess trypanocidal powers. From this small beginning followed the discovery that in parasitic conditions as dissimilar as Leishmaniasis and Schistosomiasis the curative action of antimony is specific. At first the only antimony compounds used in chemotherapy were potassium and sodium antimonyl tartrates. Later "organic" compounds of quinquivalent antimony, with antimony joined directly to carbon became available, as a result of the work of Professor Hans Schmidt, who first described the process of diazo-synthesis. In this process, by the interaction of diazotized aniline and antimony trioxide, in the presence of alkali, phenylstibinic acid is produced. It is thus peculiarly suitable that Professor Schmidt, with the assistance of Dr. Peter should summarize our knowledge of the chemotherapeutic

action of antimony compounds. After a short introductory chapter, the various parasitic diseases encountered in human and veterinary medicine, in which antimony has been tested, are exhaustively discussed. The method of exposition is somewhat unusual, for in place of a continuous narrative, each page is split up into a series of rather disconnected paragraphs, headed by the name of an author with the title and reference to his paper. The book thus reads not unlike a bound volume of the *Tropical Diseases Bulletin* devoted entirely to the chemotherapy of antimony. While this arrangement is not without its advantages it is perhaps regrettable that the authors, with their encyclopaedic knowledge of antimony, have not seen their way to adopt a somewhat more critical attitude to the voluminous literature they have abstracted. Nevertheless, the volume will be of the greatest interest and value to all those who are interested in the young but vigorous science of chemotherapy. The reviewer pleads not guilty to having perpetrated a "Recent advances in tropical medicine."

G. M. Findlay.

BONO (Edmond). **Cysticercose cérébrale et syndromes épileptiformes.** [Cerebral Cysticercosis and Epileptiform Syndromes.] Thèse du Laboratoire de Parasitologie de la Faculté de Médecine d'Alger. Thèse No. 9. 157 pp. [Bibliography.] 1936. Algiers.

After eleven dedications, the thesis itself deals with epilepsy caused by cerebral cysticercosis in terms of the ancient ban on the pig, measly or otherwise, from Moses onwards; the parasite, which has been detected in 4 of 104,455 pigs killed in Algerian slaughter houses; the pathological anatomy; an abstract of 68 papers from the literature, with this *Bulletin* as the source of information in some; the diagnosis, in which an important place is given to the amount of albumin in the cerebrospinal fluid drawn off by lumbar puncture, namely 0.4 to 0.75 [? per cent.]; and the treatment, which it is held, can only be surgical.

Clayton Lane.

TROPICAL DISEASES BULLETIN.

Vol. 34.]

1937.

[No. 9.

RABIES.

A REVIEW OF RECENT ARTICLES. XXVII.*

i. *Virus.*

It is a curious fact that, since Noguchi claimed in 1913 to have cultivated the virus of rabies, no conclusive confirmation should appear for 24 years, and that now two sets of workers, almost simultaneously should afford that confirmation working independently, but using almost identical methods of cultivation. These are KANAZAWA^{1, 2} in Tokio, and WEBSTER and CLOW³ at the Rockefeller Institute for Medical Research. In both cases the culture medium is a Tyrode solution containing fragments of embryonic rabbit brain. The respective prescriptions are :—

Japanese.

Tyrode 5 per cent.	...	...	...	...	...	100 cc.
Embryonic rabbit brain (25th day) emulsion	...	...	...	...	...	4 to 5 drops

American.

Tyrode 4 per cent. containing 10 per cent. normal					
monkey brain serum	...	...	...	...	50 cc.
Minced mouse embryo brain	...	...	...	...	0.02 cc.

After inoculation with virus, the supernatant fluid is withdrawn at intervals of 3 or 4 days and transferred to a second culture flask. KANAZAWA found that the virulence of the subculture, at first relatively high, falls rapidly, and then increases from the 3rd day, reaching a maximum higher than the original titre between the 4th and 6th days. So far KANAZAWA has passed fixed virus through 26 passages or over a period of 119 days. He finds that the properties of the cultivated virus are unchanged, as regards neutralization by immune serum and as regards absence of negriogenesis. WEBSTER and Clow have carried a skunk strain through 16 serial subcultures, and

*For the twenty-sixth of this series see 1937, Vol 34, p 230.

¹KANAZAWA (K.). Sur la culture *in vitro* du virus de la rage (Deuxième mémoire.)—*Japanese Jl. Experim Med.* 1937 Feb. 20 Vol. 15 No. 1. pp. 17-27. With 2 figs.

²KANAZAWA (K.). Sur la culture *in vitro* du virus de la rage—*Japanese Jl. Experim. Med.* 1936 Oct. 20. Vol. 14. No 5. pp 519-522.

³WEBSTER (Leslie T.) & CLOW (Anna D.). Propagation of Rabies Virus in Tissue culture and the Successful Use of Culture Virus as an Antirabic Vaccine. —*Science.* 1936. Nov. 27. Vol 84 No 2187 pp. 487-488.

also a dog strain. They state that "the culture virus protects mice against street virus, and that a single peritoneal inoculation is innocuous and within 10 days makes an animal resistant to 100 intracerebral fatal doses of street virus of homologous or heterologous strains. They are engaged in studying the possibility of using tissue culture virus as an antirabic vaccine.

In a preliminary note PERAGALLO⁴ states that he has succeeded in cultivating the virus on the chorion-allantoid membrane of the chick. The procedure adopted followed the same lines as have been used for the cultivation of vaccinia. Serial passage has been carried out—Negri bodies are found in the epithelial cells of the membrane, and the membrane itself is capable of infecting test animals. Subcultures of both fixed and street virus have been made. The numbers of passages are not given.

The characteristics of the strain of fixed virus employed at Hanoi (Indo-China) have been investigated by GENEVRAY and DODERO.⁵ The strain is in its 2,033rd passage, and is of high virulence (paralysis of rabbit on the 4th or 5th day). It differs from the original Paris strain in various respects. It is rather less aggressive when given subcutaneously; its resistance to desiccation and to glycerine has diminished, but in a considerably less degree than has been the case in other institutes. In its resistance to ether it is comparable to the Tangier strain. In the last section of the paper it is shown that segments of cord embedded in paraffin (melting point 56-58°) retain virulence up to at least 60 days.

The strain of fixed virus in use at Lille continues to change. GRYSEZ⁶ states that cords preserved at 23°C. are becoming less resistant to the action of glycerine. After 15-25 days at 23° in glycerine virulence is completely lost. It thus becomes necessary to alter the scheme of dosage in the treatment of bitten persons. Various modifications are suggested, in which either the temperature or the period of drying of the cords is reduced.

REMLINGER and BAILLY⁷ recall the fact that HÖGYES started his dilution method with a virus whose lethal dose was 0.2 cc. of a 1/5000 dilution. The authors found in 1934 that the corresponding dilution for the Tangier strain was 1/900,000. They have now examined 11 viruses of Moroccan origin, and find that their virulence was very variable, the titre varying from 1/200 to 1/100,000. This variation is ascribed not to the effect of dilution but to the nature of the particular strain.

The detail of the experiments carried out with the 11 strains is given in a subsequent paper.⁸

⁴PERAGALLO (Italo). Ricerche sulla possibilità della cultura del virus rabico nella membrana corion-allantoidea dell'embrione di pollo (Nota preventiva.)—*Giorn. di Batteriol. e Immunol.* 1937. Mar. Vol. 18. No. 3. pp. 289-290. English summary (1 line)

⁵GENEVRAV (J) & DODERO (J) Le virus rabique fixe de l'Institut Pasteur de Hanoi.—*Ann. Inst. Pasteur.* 1936. Dec. Vol. 57. No. 6. pp. 638-651. With 2 graphs.

⁶GRYSEZ (Victor) Action de certaines températures sur la conservation de l'activité du virus fixe de Pasteur.—*Ann. Inst. Pasteur.* 1937. Feb. Vol. 58. No. 2. pp. 125-129.

⁷REMLINGER (P) & BAILLY (J) Action de la dilution sur les virus rabiques de rue.—*C. R. Soc. Biol.* 1937. Vol. 124. No. 1. pp. 7-9.

⁸REMLINGER (P) & BAILLY (J.). Action de la dilution sur les virus rabiques de rue.—*Ann. Inst. Pasteur.* 1937. Apr. Vol. 58. No. 4. pp. 377-387.

In 1910 (*Arch. de Méd. expér. et d'anat. pathol.*) REMLINGER pointed out that fixed virus enveloped (enrobé) in powdered bicarbonate of soda induced symptoms of furious rabies. REMLINGER and BAILLY⁹ have repeated this observation and find that the Tangiers strain of fixed virus which invariably causes dumb rabies in the rabbit, induces fury when enveloped in bicarbonate. This has been observed in the rabbit and in the dog; in the cat, the guineapig and the rat there is less marked excitation. Even in animals which have shown the most marked excitability, Negri bodies are however absent in the horn of Ammon, and in the oculomotor nucleus. The authors discuss the nature of this phenomenon. They refer to the observation of MILLISCHER and MARTEAU (this *Bulletin*, 1937, Vol. 34, p. 237) that frozen cords have the same propensity, and conclude that it is more likely to be a physico-chemical phenomenon of which the nature is difficult to determine, than a return of the fixed virus to its original street form.

GERLACH and SCHWEINBURG¹⁰ contribute a further section to their series of papers on Aujeszky's disease, published partly in the *Wien. Klin. Woch.* and partly (for veterinary consumption) in the *Ztschr. f. Infektionskr. d. Haustiere*. This group of papers forms a comprehensive study of the behaviour of numerous strains of the virus, and experimental results are recorded in detail. The ground covered is so wide that it is impossible to deal with it in a review. The main conclusions are those which have already been accepted.

A paper on the same subject by MANNINGER and MARCIS,¹¹ stresses the fact that pseudorabies reaches the central nervous system by way of the blood, and not along the nerve paths.

A case of pseudorabies (Aujeszky) in a dog is reported from Tunis by CORDIER and MÉNAGER.¹² A very thorough examination of the characteristics of the virus in question has been made, and in this the authors have received the advice and encouragement of REMLINGER. Its effects have been observed in the rabbit, the guineapig, and the pigeon, and numerous subpassages have been made. These leave the diagnosis of pseudorabies beyond doubt.

The urea content of the blood in 4 cases of pseudorabies in cattle has been examined by ROSSI.¹³ A definite and rapid increase is found to occur. The chlorides are not appreciably modified—and the excretion of urea by the urine remains normal.

⁹REMLINGER (P.) & BAILLY (J.). Modifications de la symptomatologie de la rage paralytique déterminées par l'enrobage du virus dans le bicarbonate de soude.—*C. R. Soc. Biol.* 1936 Vol. 123. No. 34. pp. 953-955.

¹⁰GERLACH (Franz) & SCHWEINBURG (Fritz). Experimentelle Untersuchungen ueber die Aujeszky'sche Krankheit (Pseudowut). II. Mitteilung.—*Ztschr. f. Infektionskr. d. Haustiere*. 1936. Dec. 8. Vol. 50. No. 2-3. pp. 86-128.

¹¹MANNINGER (R.) & MARCIS (A.). Versuche mit dem Erreger der Aujeszky'schen Krankheit.—*Ztschr. f. Infektionskr. d. Haustiere*. 1937. Apr. 12. Vol. 51. No. 1. pp. 25-32.

¹²CORDIER (G.) & MÉNAGER (J.). Premier cas "africain" de maladie d'Aujeszky.—*Bull. Acad. Méd.* 1937. May 11. 101st Year. 3rd Ser. Vol. 117. No. 18. pp. 532-535.

¹³ROSSI (Paul). L'urée sanguine chez les bovins atteints de maladie d'Aujeszky.—*C. R. Soc. Biol.* 1937. Vol. 124. No. 8. pp. 706-707.

ii. *Symptoms and Diagnosis.*

A case of human rabies is reported from Nigeria by CRAWFORD¹⁴.

An interesting and unexpected point comes to light in a paper by HORGAN and MCKINNON.¹⁵

It will be remembered that the rôle of the oculomotor nucleus as a seat of election for Negri bodies was pointed out by THOMAS and JACKSON (this *Bulletin*, 1931, Vol. 28, p. 744). This result was confirmed by NICOLAU and KOPCIOWSKA (1932, Vol. 29, p. 600 and 1933, Vol. 30, p. 575), and by MURATOWA (1935, Vol. 32, p. 173) who showed that the first appearance of Negri bodies is not in the horn of Ammon; but in the mid-brain. It may be remembered that the reviewer invited "those who have access to the necessary material to put these statements to the test, and to publish their findings, as the matter is of considerable importance" (1931, Vol. 28, p. 745). HORGAN and MCKINNON have collected the results of the examination of the brains of 37 animals suspected to have died of rabies. These may be classified as follows:—

Negri bodies present in—

Hippocampus and midbrain	...	...	10
Hippocampus only	...	...	8
Midbrain only	...	...	0
In neither situation	...	...	19
			—
			37
			—

Of the 37, 3 were donkey's brains, 1 a sheep's brain, another that of a rabbit inoculated from a human case, and the remainder were from dogs. The authors point out that the results obtained by the former workers were all from the brains of rabbits and mice which had been experimentally inoculated, whereas their own results were obtained from the brains of naturally infected animals, the majority of which were dogs. They claim that for the diagnosis of rabies in the naturally infected dog, the hippocampus is superior to the midbrain. Further work should clearly be done to find out the exact cause of the apparent discrepancy.

iii. *Pathology.*

The presence of intravascular bodies in the brain and cord of animals (rabbits, guineapigs, monkeys and dogs) is described by COLES.¹⁶ The bodies are found in the endothelial cells of the small blood vessels of the brain. The method of staining employed was that of Giemsa. The bodies are "round or oval, rarely irregular in shape, and generally stained blue. They varied in size . . . being about $\frac{1}{2}$ –1 μ in diameter, but larger forms are also met with, some reaching 5 or even 6 μ The great majority show no structure, but in some a spot was seen situated in the centre or at one side, and this was deeper and

¹⁴CRAWFORD (R. P.). Notes on a Case of Human Rabies.—*West African Med. Jl.* 1936. Oct. Vol. 9. No. 1. p. 20.

¹⁵HORGAN (E. S.) & MCKINNON (R. M.). A Comparison of the Mesencephalon and Hippocampus as Sites of Election for Negri Bodies in Rabies.—*Jl. Hygiene.* 1937. Apr. Vol. 37. No. 2. pp. 340–344.

¹⁶COLES (Alfred C.). Intra-Endothelial Bodies in the Vessels of the Brain and Spinal Cord in Rabies.—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 315–319. With 12 figs. on 1 plate.

darker in colour but still blue or reddish blue." Sometimes clusters of bodies were seen which might represent division forms. The bodies "were found only in the small and medium vessels of the brain... never in the smallest capillaries, and practically never outside a vessel. In many instances it was at once obvious that they were situated in the endothelial cells of the vessel." "The granules are certainly not artefacts, pigment granules or mast cell granules." "Their position . . . suggests a similarity to the Rickettsia parasites found in typhus." From an examination of slides kindly furnished by the author, the reviewer subscribes to the above description.

In a group of three communications MANOUÉLIAN¹⁷ discusses the enervation of the face in relation to rabies. It is well known that bites on the face are much more dangerous than bites in other regions. The author points out that in addition to the recognized sympathetic ganglia related to the trigeminal nerve, "endoneurocytes" are found in its sensory branches. These may be isolated or in groups, in some cases forming actual ganglia. "What is the nature of these cells, are they sympathetic or sensory or both together? That remains for future research." But the important point is that the endoneurocytes may contain Negri bodies, and that the cells themselves undergo the same cytological changes as are seen in Rabies. The extreme gravity of face bites is thus due to the relative excess of neurones in the face as compared with other localities.

In the second place MANOUÉLIAN¹⁸ finds that the cranial nerves, particularly the fifth, possess a higher degree of virulence than the spinal nerves. This is another consequence of the presence of intranervous cells in the cranial nerves. Inoculation of a sensory nerve of the face is, in fact, inoculation of ganglionic tissue.

In a third communication MANOUÉLIAN¹⁹ points out that just as the virulence of the saliva is due to the shedding of neurones into the secretion, so also may virulent neurones be released from the tongue by a fissure or abrasion.

iv. *Methods of Treatment and Statistics.*

SAVAGNONE²⁰ has investigated the immunizing properties of a new type of filtered virus. The filtrate is obtained as follows. To an emulsion prepared by Puntoni's method are added small quantities (1-2 per cent.) of powdered animal charcoal. The charcoal sinks to the bottom, the supernatant fluid is aspirated off, and is then after dilution with one-third of an isotonic solution passed through a Berkefeld V bougie. This filtrate was found to have retained its infecting and its immunizing properties. The author has tested it on the guineapig, and on the dog and suggests that its use might be extended to man. He thinks that it is possible that the liability to post-vaccinal sequelae may in this way be reduced.

¹⁷MANOUÉLIAN (Y.). Haute gravité des morsures de la face dans la rage. Endoneurocytes du trijumeau.—*C. R. Soc. Biol.* 1936. Vol. 123. No. 32. pp. 771-773. With 1 fig.

¹⁸MANOUÉLIAN (Y.). Virulence des nerfs de la face au cours de la rage.—*C. R. Soc. Biol.* 1936. Vol. 123. No. 32. pp. 773-774.

¹⁹MANOUÉLIAN (Y.). Neurones sympathiques périphériques de la face; leur rôle au cours de la rage.—*C. R. Soc. Biol.* 1936. Vol. 123. No. 35. pp. 1084-1086.

²⁰SAVAGNONE (Lucio). Sul potere patogeno ed immunizzante di un nuovo filtrato rabbico.—*Giorn. di Batteriol. e Immunol.* 1937. Mar. Vol. 18. No. 3. pp. 368-380. English summary (7 lines).

It is reported by VAZ²¹ that of 3,643 persons treated at 276 different centres by vaccine prepared according to Puntoni's method and supplied from the parent institute at San Paulo (Brazil), none developed rabies.

The statistics of antirabic treatment from the various institutes over the world, for the year 1934, collected by the League of Nations are reviewed by McKENDRICK.²² This is the seventh review of the series and relates to 110,884 treated persons, of whom 335 died of rabies in spite of treatment (0.30 per cent.). The statistics are tabulated according to the various characteristics laid down by the Paris Rabies Conference, and in addition to those relating to the year under review the combined figures collected during that and the preceding six years are treated as a whole. With regard to the comparative efficiencies of the different methods of treatment as immunizing agents, it appears from the evidence so far available, that there seems to be little to choose between the cord, dilution, killed phenol, heated and killed ether methods, and that if anything the system in which dilution methods are reinforced in severe cases by ALIVISATO's ether vaccines has yielded slightly better results than the other methods. A new method of dealing with statistics of this nature, and of arriving at an estimate of comparative efficiency has been employed. Some interesting points emerge as regards paralytic accidents. These have been subdivided into fatal and non-fatal. It appears that both fatal and non-fatal accidents are relatively infrequent amongst those treated by killed phenol, killed ether and heated vaccines, the incidence rate for fatal accidents being of the order of 0.003, and for non-fatal 0.008 per cent.; that both fatal and non-fatal accidents are relatively frequent amongst those treated by FERMI's original vaccine, the rates being 0.05 and 0.016 per cent. respectively; that with treatment by cords fatal accidents are relatively infrequent (0.003 per cent.), whilst non-fatal are relatively frequent (0.028 per cent.); and that with dilution treatment accidents are relatively frequent and usually fatal (0.03 per cent. for total and 0.01 per cent. for non-fatal), whilst with the mixed method (dilution + Alivisato's) they are relatively infrequent but usually non-fatal (0.004 for total and 0.046 for non-fatal). This last result is a curious one, and so far no explanation is forthcoming.

v. Rabies in Animals.

TORRES and LIMA²³ report further observations on rabies in the vampire bat (for previous papers see this *Bulletin*, 1937, Vol. 34, p. 230). From these experiments it appears that a bat which on account of a high natural resistance to infection has become a carrier, may eliminate the virus up to about 4 months, and so infect other animals which it bites, and even other bats with whom it has been in contact. The

²¹VAZ (Eduardo). Santa Casa e serviço anti-rabico — *Ann. Paulist. Med. e Cirurg.* 1936. Nov. Vol. 32. No. 5. pp. 437–440.

²²McKENDRICK (A. G.). A Seventh Analytical Review of Reports from Pasteur Institutes on the Results of Anti-Rabies Treatment — *Bull. Health Organization*. (League of Nations) Geneva. 1937. Feb. Vol. 6. No. 1. pp. 17–55.

²³TORRES (Sylvio) & LIMA (E. de Queiroz). A raiva e os morcegos hematofagos. Morcegos que resistem á infecção tornam-se portadores e eliminadores de vírus? — *Rev. Depart. Nac. da Produção Animal*. Rio de Janeiro. 1936. Dec. Vol. 3. Nos. 1–6. pp. 165–174. English summary.

proportion of experimentally infected bats which proved resistant was 4 out of 9, whilst the proportion of successful infections from bat to bat was 2 out of 4.

Another series of observations on bat infection is given by TORRES²⁴. Six hungry bats did not bite a pup which shared their cage during a period of 3 days—and, similarly, two hungry bats did not bite a dog suffering from paralytic rabies over a period of 2 days. On the other hand two out of three bats which had shared the cage of a goat in the first day of rabies sickness became infected.

The literature on rabies in the bat continues to increase rapidly.

PAWAN²⁵ adds to previous researches to which reference has already been made (this *Bulletin*, 1936, Vol. 33, p. 742). He now studies the course of the infection in experimentally inoculated bats.

The protocols of the various experiments are given in detail. The incubation period after artificial inoculation is variable. Various clinical types were observed: (1) typical furious rabies, ending in paralysis and death; (2) typical paralytic rabies, ending fatally; (3) a furious form followed by recovery; (4) a furious form ending fatally without an intermediate paralytic stage; (5) a form in which the bats die suddenly without previous evidence of illness; (6) a latent form of infection. Once paralytic symptoms appear there is no recovery. It is thus seen that "bats may become carriers of rabies after 'recovery' from the furious form of the disease. In this state they may remain capable of spreading infection by their bites for prolonged periods."

JAUFFRET²⁶ describes a campaign against rabies in the dog conducted in CAMBODIA (Indo-China). 385 dogs have been inoculated with a formulated vaccine. Of these 5 died, but only one of the deaths could be ascribed to the effects of vaccination. The author emphasizes the importance of destruction of stray dogs, and progressive vaccination of the remaining dog population.

JAKEMAN²⁷ discusses some general points in the control of rabies in animals.

The difficulty of obtaining quantitative results as regards the degree of immunity in animals is discussed by WEBSTER²⁸. An intradural test dose is usually overwhelming, whereas the effect of peripheral dosage is difficult to measure. "These technical difficulties have now been overcome in part by finding that special strains of mice bred for susceptibility to virus infections are 10 to 100 times more susceptible

²⁴TORRES (Sylvio). A raiva e a infecção natural dos morcegos hematofagos—*Rev. Depart. Nac. da Produção Animal* Rio de Janeiro 1936. Dec. Vol. 3. Nos 1-6. pp. 183-186. English summary.

²⁵PAWAN (J. L.). Rabies in the Vampire Bat of Trinidad, with Special Reference to the Clinical Course and the Latency of Infection—*Ann Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30 No 4 pp. 401-422. [20 refs.]

²⁶JAUFFRET (R.). Une campagne de vaccination contre la rage du chien au Cambodge.—*Arch. Inst. Pasteur d'Indochine*. 1936. Apr Vol. 6. No. 23. pp. 393-401.

²⁷JAKEMAN (Harry W.). Some Phases of Rabies and Distemper Control.—*Jl. Amer. Vet. Med. Assoc.* 1937. Apr. Vol. 90. No 4. pp. 493-500.

²⁸WEBSTER (Leslie T.). Diagnostic and Immunological Tests of Rabies in Mice.—*Amer. Jl. Public Health*. 1936. Dec. Vol. 26. No. 12. pp. 1207-1210. With 3 figs.

to rabies than other laboratory animals per gram of body weight." "One-hundred-millionth gm. of mouse brain virus is fatal to at least 50 per cent. of these mice when injected intracerebrally, the intramuscular and subcutaneous dosage is 1/10,000 gm." Mouse protection tests have been employed in various directions. A serum protection test was employed to measure the amount of neutralizing antibodies in mice following experimental vaccination. In one series of tests sera of persons treated with vaccines containing live virus were found to neutralize 100 to 1000 lethal doses over periods as long as 4 years. One Semple vaccine (G) treatment remained effective (neutralized 100 doses) up to 15 months. A second Semple vaccine (N) however had no effect.

Resistance tests were also carried out. "Results thus far suggest, from the theoretical view-point, that neutralizing antibodies are not always a direct measure of resistance, and that vaccines containing no demonstrable living virus may produce resistance. Moreover, they show that the optimum method of securing prompt and effective immunity to rabies in the mouse is by the intraperitoneal injection of relatively large amounts of vaccine, 6 doses, one every other day."

vi. Miscellaneous.

LEVADITI, SCHOEN and REINIÉ²⁹ continue their researches on negri-genesis in tumour cells. It will be remembered that this occurred in the case of PEARCE's carcinoma (this *Bulletin*, 1936, Vol. 33, p. 750). In a couple of experiments on rabbits suffering from SHOPE's papilloma, the tumour cells were much less affected: some oxyphil bodies of doubtful nature were seen, and one out of 9 rabbits inoculated with tumour tissue became infected. Thus the affinity towards different neoplasms varies considerably. It depends not only on the nature of the neoplasms (ectodermic or mesodermic), but also on their proliferative capacity.

A later paper³⁰ gives a continuation of the research already referred to (this *Bulletin*, 1936, Vol. 33, p. 750) on negri-genesis in PEARCE's carcinoma. Street virus Rabies has been transmitted through 9 subpassages, by simple implantation of infected tumour tissue into the anterior chamber of the eye. Typical Negri bodies are seen in the tumour cells. They are more numerous in the older corneal cells close to Descemet's membrane than in those of the deeper layers. Using fixed virus it was not possible to obtain subpassages with regularity, as was the case with street virus. Thus the virus of rabies appears to have an affinity for embryonic tissue, and in the state of "street virus" it can in embryonic tissue go through the complete cycle of its evolution.

HAGUENAU, CRUVEILHIER and VIALA³¹ find that the action of antirabic vaccine during the period of lactation leads to the regression

²⁹LEVADITI (C.), SCHOEN (R.) & REINIÉ (L.). Virus rabique des rues et papillome de Shope.—*C. R. Soc. Biol.* 1937. Vol. 124. No. 9. pp. 793-794.

³⁰LEVADITI (C.), SCHOEN (R.) & REINIÉ (L.). Virus rabique et cellules néoplasiques.—*Ann. Inst. Pasteur.* 1937. Apr. Vol. 58. No. 4. pp. 353-376. With 13 figs.

³¹HAGUENAU (J.), CRUVEILHIER (L.) & VIALA (C.). Effets de l'action conjuguée du virus rabique et de la lactation sur la tumeur de Shopes du lapin.—*C. R. Soc. Biol.* 1937. Vol. 124. No. 10. pp. 892-893.

of SHOPE's carcinoma in the rabbit. On the other hand, neither antirabic vaccine alone, nor lactation alone, nor normal brain substance associated with lactation have any effect. The regression was complete when lactation was complete, and partial when lactation was partial.

A case of poliomyelitis acuta in which there was a previous history of the patient having been bitten by a dog, has been investigated by VELDE³². After a discussion of the literature relating to somewhat similar cases, he concludes that in the case under review there is little evidence of any direct relation between the bite and the poliomyelitis.

A. G. McKendrick.

³²VELDE (G.). Poliomyelitis acuta und Hundebiss.—*Med. Klin.* 1936. Dec. 4. Vol. 32. No. 49. pp. 1667-1669.

YELLOW FEVER.

BOLETÍN DE LA OFICINA SANITARIA PANAMERICANA. 1936. Aug. Vol. 15. No. 8. pp. 744-751. [11 refs.]-El estado actual del problema de la fiebre amarilla. [The Present State of the Yellow Fever Problem.]

This article, prepared by the Yellow Fever Service of Brazil, with the assistance of the Rockefeller Foundation, adequately sums up present-day knowledge of yellow fever. It is intended as a summary and therefore contains nothing new. The points on which stress is laid are :—

1. Ordinary urban yellow fever being transmitted by *Aedes aegypti* is controllable by anti-mosquito (including anti-larval) measures.

2. Selvatic yellow fever occurs independently of *Aedes*, assumes epidemic proportions in Southern Brazil, Bolivia and eastern Colombia and is sporadic in Magdalena and the Amazon Valley.

3. Selvatic or jungle yellow fever attacks those individuals only who enter or work in the woods.

4. Examinations of portions of liver removed from bodies with the viscerotome is the best method of diagnosis after death, and the protection test with the serum of suspected cases the best in life.

5. Vaccination probably affords the best protection against selvatic yellow fever.

6. Captured monkeys show a natural immunity to infection with virus, but we do not yet know either the animal hosts, the vectors, or the way in which the infection traverses large tracts of forest.

H. H. S.

SAWYER (Wilbur A.), BAUER (Johannes H.) & WHITMAN (Loring). **The Distribution of Yellow Fever Immunity in North America, Central America, the West Indies, Europe, Asia, and Australia, with Special Reference to the Specificity of the Protection Test.**—*Amer. Jl. Trop. Med.* 1937. Mar. Vol. 17. No. 2. pp. 137-161. With 3 maps. [24 refs.]

A valuable summary of earlier investigations on the distribution of yellow fever immunity together with the authors' final report on surveys in all countries outside of Africa and South America. The specificity of the yellow fever protection test in mice is dealt with in detail and it is shown that out of 876 human sera from Asia and Australia, where presumably the disease has never been present, only 2 specimens showed protection against yellow fever virus. Among 481 sera from Italy, Spain, Portugal, Canada and the U.S.A., where the disease was formerly present but is now absent, only one was protective. The nature of these odd cases showing non-specific virucidal substances in the blood is very obscure, and the blood of one of them was tested against two other viruses, but possessed no protective properties against either. The blood of this particular subject, a Tamil who had never been out of India, protected mice against 10 per cent. yellow fever, virus-brain suspension, even when the serum was diluted 1 : 10, and these protective properties lasted for at least 3 years. It would appear, therefore, that occasionally,

but only very rarely, yellow fever virucidal substances may be present in the serum of persons who have never been exposed to infection.

A total of 1,177 sera were tested from various islands in the West Indies: Barbados, Cuba, Jamaica, Porto Rico, St. Lucia and Trinidad. The 821 sera from persons under 20 years of age were all negative, but of the remaining 356, 20 years or older, 30, or 8.42 per cent., gave positive protection tests.

A total of 1,089 sera from Mexico gave the following results:—

Age group of donors	No. tested	No. positive	Percentage positive
5-9 years	321	3	0.90
10-14 years	386	33	8.55
15-19 "	59	17	28.81
20 years and over	323	138	42.72

All sera from children born after 1925 gave negative results, so the disease has probably now disappeared from Mexico.

A total of 1,182 specimens from the 7 Central American countries gave very similar results for El Salvador, Guatemala, British Honduras, Honduras and Nicaragua, but in the case of Panama and Costa Rica the disease seems to have been absent for a longer time, as the sera of all persons under 20 years were negative. *E. Hindle.*

SUDAN MEDICAL SERVICE REPORT FOR THE YEAR 1935 [PRIDIE (E. D.), Director]. [Yellow Fever pp. 74-75.]

Survey work in yellow fever was continued in the Sudan in two directions: 1. Examination of liver tissue obtained by viscerotome from as many patients as possible who died in 8-9 days with jaundice or a history of fever of unknown origin. 2. Collection of sera for mouse-protection tests.

Under the former 30 specimens were received; 29 were negative. The other was from a man of 25 years of age with symptoms suggestive of yellow fever. He arrived at Malakal after a journey of four days from Liri Nuba and was taken ill 16 days afterwards with epigastric pain and vomiting. Three days later he was intensely jaundiced and comatose. There was no history of any fever, nor was there any while he was in hospital. He died on the third day after admission, *i.e.*, after an illness of 6 days. The slide was sent to Dr. G. M. FINDLAY, who thought the changes extraordinarily suggestive of yellow fever, but the history of early jaundice and the absence of fever were strong points on the other side.

Under the second, sera from 29 patients were sent to London. Nine gave protection by the mouse test, 8 from Southern Sudan and one from Wad Medani.

In this connexion attention must be directed to the peculiar syndrome of moderate fever, deep jaundice and vomiting with albuminuria which has been observed in the Sudan for the past two years or more. Some cases end fatally; mouse protection tests give negative results and there is marked liver necrosis. This condition bears a strong resemblance to "an obscure infective disease associated with jaundice"

reported from Nigeria in 1931. [See this *Bulletin*, 1931, Vol. 28, p. 858 ; if the reviewer recollects aright, this disease was 'epidemic' in Nigeria, but that it was 'infective' was not proved.] H. H. S.

PELTIER (M.). Les fièvres de nature indéterminée dans les colonies françaises. [**Fever of Uncertain Nature in the French Colonies.**]—*Ann. de Méd. et de Pharm. Colon.* 1936. Apr.–May–June. Vol. 34. No. 2. pp. 215–235. [38 refs.]

Among the febrile conditions referred to in this article are some about which there is little doubt, such as dengue, pappataci fever, typhus, Weil's disease, but others mentioned certainly call for further investigation: Thus the *Inflammatory* or *Antilles fever*, with abrupt onset, temperature 40°–41°C., severe headache, injected conjunctiva, lasting 4 or 5 days, then, after a brief remission, a return of fever with gastric symptoms; albuminuria is present but not marked and is a transient sign only. The author knows of no case of true yellow fever occurring from *Aedes* biting a patient with "inflammatory fever," but the description is very suggestive of mild yellow fever. The mouse protection test ought, of course, to be made.

Again, the *Black Vomit of Guadeloupe* would seem to leave no doubt of being yellow fever, but its attacks are almost confined to children, during the period March–June, and Creole children, not Europeans, and one attack does not confer immunity. Some think it is malaria, but plasmodia are not found in the blood and quinine is ineffectual.

In the terminal quarter of 1932 an epidemic raged in Labé, Koumbia and Boké (French Guinea) with high fatality. In Labé there are said to have been 5,000 cases, 1,000 deaths; in Koumbia 3,000 cases, 500 deaths; in Boké 600 cases, 40 deaths [the round figures make one suspicious of the accuracy of these returns], altogether 8,600 cases, 1,540 deaths, a 17·9 per cent. fatality. The symptoms were sudden onset of fever with headache, profuse epistaxis, serous diarrhoea, sometimes vomiting, jaundice, usually slight but persisting, no pulmonary complications; death occurred or recovery began to set in on the 12th to 14th day.

Other febrile conditions referred to are dioundé [see this *Bulletin*, 1933, Vol. 30, p. 719] and *fièvre rouge* of the Congo [this *Bulletin*, 1932, Vol. 29, pp. 454, 795; 1935, Vol. 32, p. 171]. H. H. S.

BENARROCH (E. I.). La fiebre amarilla de Guayana en 1929. [**Yellow Fever in Guayana (Venezuela) in 1929.**]—*Gac. Méd. de Caracas.* 1936. Jan. 31. Vol. 43. No. 2. pp. 19–22. With 3 charts.

The last outbreaks of yellow fever in Venezuela were recorded in Coro (1918), Maracaibo (1917), Maracay (1914) and Caracas (1912). That referred to in the present paper started at El Callao towards the end of June 1928. The total of cases numbered between 250 and 300, of which 15 ended fatally, and the outbreak terminated in April 1929. Those seen by the author occurred in Guasipati, a locality with about 1,500 inhabitants. A typical and fatal case took place in March 1929. The disease began with fever 38·5°–39·5°C., a remission to 37·5°C. on the third day when also jaundice was first noticed. Vomiting was at first bilious, then dark brown and later bloody. There was severe pain in the head, back and epigastrium. Between the 15th March and 31st May 149 cases occurred and 5 patients died—

a low fatality rate. The distribution by age was : 1-9 years 27 cases, 2 severe ; 10-19 years 70 cases and 4 fatal ; 20-29 years 31 cases ; 30-39 years 12 ; 40 years and over, 9 cases. The outbreak was essentially a "domestic" one ; the house *Aedes* larva index was 100 per cent., and adults 80 per cent. The diagnosis was confirmed by autopsy, histological examination of tissues and by serological tests carried out by investigators of the Rockefeller Foundation. *H. H. S.*

CARVALLO (T.). Conceptos sobre fiebre amarilla e inmigración. [**Observations on Yellow Fever and Immigration.**].—*Gac. Méd. de Caracas*. 1936. Jan. 31. Vol. 43. No. 2. pp. 22-25.

Remarks of a general character on immigration and the introduction and disappearance of yellow fever, instigated and based upon BENARROCH's paper above. *H. H. S.*

STOCK (P. G.). Une épidémie de fièvre jaune survenue en mer sur un navire.—*Procès-Verb. Comité Permanent de l'Office Int. Hyg. Publ. Séssion ordinaire d'Oct., 1936*. pp. 53-56.

PUBLIC HEALTH REPORTS. 1937. Mar. 19. Vol. 52. No. 12. pp. 336-337.—**Yellow Fever on Shipboard.**

An interesting account of an outbreak of yellow fever on board a steamer travelling between Dakar, French West Africa and the River Tyne, England, during which there were 14 cases of severe illness with 7 deaths, among a crew of 24.

The ship spent 8 days loading cargo at Kaolakh and Zighinchor (July 31st to August 7th, 1936) and sailed from Dakar on August 9th. Between August 13th and 19th, 14 of the officers and crew became ill, and at Madeira this illness was diagnosed as food poisoning. On arrival in England 7 members of the original crew had died with symptoms, including intense jaundice, strongly suggestive of yellow fever, 5 were in hospital at Madeira, and 2 had been ill but remained on duty. In view of the possibility of yellow fever, protection tests were made with samples of blood from members of the crew, some of them new hands engaged to replace the sick, and of 14 samples examined, 6 gave a positive reaction, including 4 from men who had been hospitalized in Madeira and 2 from the men who had been ill but remained on duty ; none of the 8 negative had shown any symptoms of illness. *E. H.*

GALVÃO (A. Ayroza) & LANE (John). Notas sobre mosquitos de Juquiá (Estado de S. Paulo). [**On Mosquitoes of Juquiá, S. Paulo.**].—Reprinted from *Rev. Biol. e Hyg.* 1935. Dec. Vol. 6. No. 2. pp. 113-120. With 8 figs.

In November 1935 the authors visited Poço Grande, about 10 kilometres distant from S. Antonio do Juquiá, and 80 metres above sea level. They made a collection of mosquitoes which appear to be fairly abundant there ; they caught approximately 2,000 in 3 hours. Among them were *Aedes* belonging to two groups, *fulvus* and *scapularis* ; *Psorophora* and *Janthinosoma*. Of the first were the following species : *nubilus*, *serratus*, *fulvus* ; of the second, *crinifer* and *leucomelas*. Their interest for human medicine lies in their possible capabilities as vectors of the yellow fever virus.

H. H. S.

KOMP (W. H. W.). An Annotated List of the Mosquitoes found in the Vicinity of an Endemic Focus of Yellow Fever in the Republic of Colombia.—Reprinted from *Proc. Entom. Soc. Washington*. 1936. Apr. Vol. 38. No. 4. pp. 57–70. [17 refs.]

BURKE (A. W.). **An Epidemic of Jungle Yellow Fever on the Planalto of Matto Grosso, Brazil.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 313–314. With 2 maps & 1 fig. [17 refs.]

A detailed account of an epidemic of 201 cases of yellow fever of the jungle type, without *Aedes aegypti*, on the Planalto of Matto Grosso, Brazil, during 1934 and 1935.

The identity of the disease was established by clinical observation, autopsy, protection test, and the transfer of infection from early human cases direct to white mice. In 15 cases negative protection tests were obtained before the onset of the illness, or early in the course of the disease, followed by positive protection tests with the convalescent sera.

A protection test survey gave results supporting the view that the outbreak was probably part of Amazonian jungle endemicity. Thus the examination of 94 inhabitants of the town Coronel Ponce gave only 7·5 per cent. positive; 150 persons from houses more than 3 km. from fields and jungle gave 16·7 per cent. positive; whilst 430 from houses less than 3 km. from fields and jungle gave 39·3 per cent. positive.

The paucity of the human population in the infected district and the scatter of cases both in time and space, together with the isolated circumstances attending many of the cases, argue against man being the only vertebrate host involved. Moreover, the sera from 5 *Cebus* monkeys caught in known infected districts all gave positive protection tests.

All available evidence points to the infection occurring either in clearings next to the jungle, or in the jungle itself, the rural rates of infection rising as the proximity of the house to fields and jungle increases.

The vector or vectors of yellow fever in this region present an interesting problem, and in view of the occurrence of jungle yellow fever in Brazil, Bolivia and Colombia, under widely different conditions, more than one carrier may be involved. *E. H.*

ARAGÃO (Henrique de Beaurepaire). Transmissão da febre amarella sylvestre pelo stegomyia (*Aedes egypti*) e pelos mosquitos da Matta.—*Brasil-Médico*. 1937. Apr. 24. Vol. 51. No. 17. pp. 497–499.

CHOWDHURY (K. L.) & GANGULI (A. C.). **The Problem of the Control of Stegomyia Mosquitoes in Calcutta with Special Reference to Yellow Fever and Dengue. With Appendix A & B.**—*Jl. Indian Med. Assoc.* 1937. May. Vol. 6. No. 8. pp. 421–426. With 1 map & 2 charts. [23 refs.]

The record of a *Stegomyia* survey undertaken in Calcutta in view of the increased danger of importation of yellow fever by aerial traffic.

The percentage of houses infested with larvae was 12·6, *Aedes aegypti* being the commonest species, followed by *A. albopictus*. Dengue is common in Calcutta and in heavy epidemics may affect 30–40 per cent. of the population, therefore favourable conditions

obviously exist for the spread of yellow fever. The main breeding places were found to be rain-water collected in unserviceable articles and water-storage cisterns, which together were responsible for 82 per cent. of the 2,312 breeding places examined. Continuous water supply at high pressure and a thorough house-to-house inspection once a week are considered necessary for control.

Appendix A by Dr. M. T. MORGAN comprises notes on a tour of inspection of the Co-operative Anti-yellow Fever Service in Brazil. [see this *Bulletin*, 1935, Vol. 32, p. 585].

Appendix B gives particulars of the Notification of the Government of India *re* Yellow Fever Menace.

" 'In exercise of the power conferred by section 2 of the Epidemic Diseases Act, 1897 (III of 1897) the Governor-General-in-Council being satisfied that India is threatened with an outbreak of yellow fever, is pleased to direct (1) that no person shall arrive in India by an aircraft, within nine days of his being in an area in which yellow fever exists, or in which, though the disease has not been clinically demonstrated, there is presumptive evidence, as a result of mouse protection tests, that the disease has occurred in that area, unless he has been protected by satisfactory inoculation, or previous attack of the disease, and (2) that no aircraft, which started from or alighted in any such area, shall enter India.' "

E. H.

PUBLIC HEALTH REPORTS. 1937. May 21. Vol. 52. No. 21. pp. 671-672.—**Airplane Company Institutes Measures against Yellow Fever.**

A report that Pan American Airways, Inc. has instituted the following control measures in view of the possibility of infected mosquitoes being introduced from South America.

" 1. All flying personnel not already vaccinated against yellow fever will be vaccinated here in Rio de Janeiro at the Rockefeller laboratory. This will be begun at once, and will be finished as soon as may be possible. The flying personnel will include aviators, radio operators, flying mechanics, pursers, stewards, etc.

" 2. Beginning May 1, 1937, cards will be filled out for all passengers which will show where they have been or have resided for the six (6) days just prior to embarking en route to the United States. These cards will be attached to the passenger list of the airplane and will be available to the Quarantine Officer on arrival at destination."

A worthy example of co-operation between an Air-Line and the Public Health Service !

E. H.

SOPER (Fred L.). **The Newer Epidemiology of Yellow Fever.**—*Amer. Jl. Public Health*. 1937. Jan. Vol. 27. No. 1. pp. 1-14. [24 refs.]

A general summary of recent observations on the epidemiology of yellow fever, with special reference to observations in South America, and the existence of a "jungle type" of the disease. This differs from the classical type, in that it occurs in the absence of *Aedes aegypti*, and persists in rural districts under conditions previously considered incompatible with yellow fever endemicity.

This jungle yellow fever, in the absence of adequate methods for its control, must be considered as a possible permanent source of the

virus for the reinfection of towns where high densities of *Aedes aegypti* are tolerated. E. H.

RICKARD (E. R.). **The Organization of the Viscerotomy Service of the Brazilian Cooperative Yellow Fever Service.**—*Amer. Jl. Trop. Med.* 1937. Mar. Vol. 17. No. 2. pp. 163-190. With 7 figs.

A detailed account of the administrative procedure of the "Viscerotomy Service" in Brazil, the success of which has depended mainly upon the proper selection and instruction of representatives who are to obtain specimens, the full application of existing legislation in regard to the registry of deaths, and the burial of bodies, making provision for representatives *faire viser* all death certificates before burial can take place, the legalization by executive decree of obligatory viscerotomy, and especially frequent visits to representatives by Service medical personnel, resulting in the maintenance of close contact between the Service offices and the representatives.

The article should be consulted in the original by all those interested in the subject as the author goes into details of the many difficulties that may be encountered and means of dealing with them in order to ensure the success of this method of investigation. E. H.

DEZEST (G.). Un cas de réaction nerveuse grave après vaccination anti-amarile. Auto-observation. [**A Case of a Serious Nervous Reaction after Yellow Fever Vaccination. Auto-Observation.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 253-257.

The author, a medical officer with the French Colonial Troops, describes the severe nervous symptoms which developed 8 days after he had received an inoculation of yellow fever vaccine [type not stated].

There was not the slightest reaction after the injection, but 8 days later a suborbital headache developed, and the aches gradually extended down the spinal column, becoming easier after about 48 hours. For the next 16 days there were sudden attacks of lumbar pains of short duration. Then the symptoms became more acute and were accompanied by the development of fever, which did not respond to aspirin, and 32 days after the inoculation it was necessary to stay in bed, and in the succeeding days the patient became delirious, with a high fever, albuminuria, low blood pressure, and finally slight jaundice of the conjunctivae and palms of the hands. The temperature dropped after 10 days, and the patient recovered his mental faculties about 8 days later. One month later some of the peripheral muscles of the right hand were found to be infected. The serum tested by Dr. Stéfanopoulo was found to protect mice up to dilutions of 1:1000.

E. H.

SAWYER (W. A.). **Experience in vaccinating against Yellow Fever with Immune Human Serum and Virus fixed for Mice.**—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 221-231. With 1 fig. [13 refs.]

The author gives a final report on yellow fever vaccination by means of immune human serum and dried living yellow fever virus fixed for

mice, which is being replaced by the use of a modified virus strain of very low virulence without injecting immune serum.

Out of the 88 persons vaccinated in the Laboratories of the International Health Division of the Rockefeller Foundation in New York, through subcutaneous injections of virus and immune serum, the protective antibody content of the blood was followed in 45 for lengths of time up to 4 years. The mean protective titres of the blood shows that antibodies appear about one week after vaccination, reach a maximum after about 6 weeks, remain at this level for $2\frac{1}{2}$ months and then gradually fall. Some sera tested after 3 and 4 years were still protective, but others had lost all power to protect after 2 years. It was concluded that blood should be examined every 2 or 3 years, and persons revaccinated if their blood had lost its protective power. Revaccination is safe and effective, but the results are not so lasting as those of the first vaccination.

Details are given of an attack of probable encephalitis which came on late in one of the vaccinated persons after humoral immunity against yellow fever had been thoroughly established. The human serum and virus used in his vaccination had been used in the immunization of 7 other persons without any unusual effects. The author reviews various possibilities, including that of some other filterable virus accidentally present in the mouse brain, but the case is not satisfactorily explained. However, it has been a stimulus in the effort to diminish the neurotropism of the virus used and to cultivate it in fowl embryo tissue *in vitro* instead of in mouse brain *in vivo*. E. H.

LAIGRET (J.), DURAND (R.) & BONNEAU (E.). Enquête sérologique dans un régiment de tirailleurs sénégalais pour le dépistage des atteintes anciennes de fièvre jaune. [**A Serological Study of a Regiment of Senegalese Tirailleurs in order to determine Previous Infection with Yellow Fever.**]*—Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 341-343.

The sera of 100 Senegalese soldiers from various French African colonies have been examined by means of the mouse-protection test and the results confirm the view that yellow fever is very widespread as indicated in the following list :—

Country	No. of Sera Tested	Positive	Negative	Doubtful
French Sudan	15	9	5	1
Dahomey	15	5	7	3
Ivory Coast	18	2	14	2
Upper Volta	14	5	6	3
French Guinea	21	7	13	1
Senegal	9	5	3	1
Niger Territory	7	2	5	—
Tchad	1	—	1	—

In view of the fact that one-third of the natives of military age have already had yellow fever, the authors advocate the general vaccination of school-children, using coated vaccine. E. H.

SELLARDS (A. W.) & LAIGRET (Jean). Preuves de l'immunité acquise contre la fièvre jaune à la suite de sa vaccination. [**Evidence of Immunity against Yellow Fever acquired after Vaccination.**]—*Arch. Inst. Pasteur de Tunis*. 1936. Nov. Vol. 25. No. 3 & 4. pp. 424-436.

The authors state that in Africa during the past three years, about 20,000 persons have been vaccinated against yellow fever, most of them in endemic areas, and not a single case of the disease had occurred in any of these subjects.

Details are given of protection tests in mice and monkeys with the serum of subjects before and after vaccination showing the development of antibodies, and particulars are given of one individual who in addition to the foregoing tests was exposed to the bites of infected *Aedes aegypti* seven months later. The patient was unaffected by this exposure to infection, whilst two *rhesus* monkeys bitten by the same lot of mosquitoes both died of yellow fever. E. H.

LAIGRET (J.), SALEUN (G.) & CECALDI (J.). Enquête sérologique sur dix-neuf sujets immunisés contre la fièvre jaune, les uns à l'aide de la vaccination, les autres à l'aide de la séro-vaccination. [**A Serological Inquiry on 19 Subjects Immunized against Yellow Fever, Some by Means of Vaccination, Others by Means of Serum-Vaccination.**]—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 8-10.

By means of intracerebral tests in mice the authors have compared the immune titre of 9 subjects vaccinated about 1 to 2 years previously by the inoculation of virus alone, with that of 10 subjects inoculated with virus and immune serum, on the average about one year previously. Although considerable individual variations are shown, the immune titres of the former are much higher than in the case of those receiving both virus and immune serum. It is of interest that in one of the first and three of the second group of those vaccinated, the protective properties of the blood had completely disappeared. Four patients vaccinated by virus alone showed titres of 25,600 units per cc., whilst only 3 of those inoculated with virus and immune serum showed titres as high as 640 units per cc. E. H.

MATHIS (C.), DURIEUX (C.) & MATHIS (M.). Est-il prudent de se faire vacciner contre la fièvre jaune en Afrique Occidentale Française. [**Is it wise to be vaccinated against Yellow Fever in French West Africa ?**]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1042-1046.

The authors show that there were 113 deaths from yellow fever in French West Africa during 1931 to 1935 inclusive, among a total white population of 27,220. Excluding the Dakar population of 10,000, where the absence of mosquitoes eliminates the risk of infection, and taking the average tour of duty as 2 years, it is estimated that during this period there is a 1 in 400 chance for each person of succumbing to the disease.

At the Pasteur Institute, Dakar, 600 inoculations have been effected without any serious accidents, but post-vaccinal reactions may occur. Details are given of the clinical histories of four young

doctors, each of whom received on the same day similar doses of the same batch of vaccine. One showed no post-vaccinal reactions, the second a slight reaction, the third a moderate one, and the fourth a prolonged reaction with symptoms lasting for about 3 weeks. The latter case, however, which must be regarded as exceptional, recovered completely without showing any after effects and his blood 6 weeks later was found to be strongly protective in mice. *E. H.*

FINDLAY (G. M.) & MACCALLUM (F. O.). **An Interference Phenomenon in Relation to Yellow Fever and Other Viruses.**—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 405-424. '35 refs.]

The authors have studied Hoskin's observation (see this *Bulletin*, 1936, Vol. 33, p. 341) that monkeys inoculated with a mixture of pantropic and neurotropic virus survive, whilst control monkeys inoculated with the pantropic virus alone succumb. When the neurotropic virus is inoculated 24 hours after the pantropic virus there is no protection. The intracerebral inoculation of 4 monkeys with this mixture resulted in death from encephalomyelitis, whilst 2 control monkeys inoculated intracerebrally with pantropic virus alone died with liver necrosis and other visceral lesions. Similarly, 7 out of 8 hedgehogs inoculated subcutaneously with the mixture died of encephalitis, whilst those inoculated with only pantropic virus died with liver necrosis and gastric haemorrhage. In mice inoculated intracerebrally with mixtures of the two viruses death is dependent on the neurotropic virus; the pantropic virus does not afford any protection against it.

The subcutaneous inoculation of 16 human beings with mixtures of the two viruses and yellow fever immune serum gave reactions similar to those induced by the neurotropic virus.

The evidence supports the view that neurotropic protects against the pantropic virus, but the latter does not protect against the neurotropic virus. This action is not due to any precocious development of immune bodies, and therefore tests were made to see if the blocking of certain cells by one virus interfered with the activity of a second virus, as in the case of certain plant viruses.

Accordingly, monkeys and mice were inoculated with mixtures of yellow fever virus and Rift Valley fever virus, and a well marked interference was obtained. Thus the inoculation of a mixture resulted in the protection of 7 out of 11 monkeys. In mice the intraperitoneal inoculation of a mixture of neurotropic yellow fever virus and pantropic Rift Valley fever virus caused a delay in the death of the mice and 6 out of 60 survived. This protective action was not seen if the Rift Valley fever virus was given 24 hours before the inoculation of yellow fever virus. No protective action against Rift Valley fever virus in mice was shown by intraperitoneal inoculation of normal mouse brain, mouse brain containing killed neurotropic virus, or India ink; and a scarcely perceptible protection by a strain of fowl pest virus, non-pathogenic for mice.

The above phenomena suggest that there may be a generic relationship between yellow fever and Rift Valley fever, which is not apparent by the ordinary tests, but shown by interference phenomena, and in this connexion the geographical distribution of the two diseases is of interest. Yellow fever is predominantly West African and has

never reached Kenya and the East Coast, whilst Rift Valley fever occurs in Kenya, Uganda, French Equatorial Africa, etc., but not in Nigeria or other West African Colonies. E. H.

THEILER (Max) & SMITH (Hugh H.). The Effect of Prolonged Cultivation *in Vitro* upon the Pathogenicity of Yellow Fever Virus.—
Jl. Experim. Med. 1937. June 1. Vol. 65. No. 6. pp. 767-786.
[16 refs.]

A valuable report on the changes that have taken place in yellow fever virus in the course of continual cultivation *in vitro* for a period of more than three years without any intervening passage through a living host.

The three strains of virus used in these experiments were all derived from the same original virus, the well-known and extremely virulent Asibi strain. In the tissue cultures one strain was propagated on whole mouse-embryo, another on fowl-embryo from which the head and spinal cord had been removed, and the other on testicular tissues of mice and guineapigs. The changes in pathogenicity of the virus cultivated for 240 subcultures during a period of more than three years in a medium containing whole mouse-embryo were not striking. The viscerotropic virulence seemed to be somewhat diminished, as it failed to produce fatal infections when inoculated subcutaneously into rhesus monkeys or hedgehogs, but a generalized infection takes place accompanied by a relatively high concentration of virus in the circulating blood. The neurotropic virulence of the strain remained unchanged.

The changes in pathogenicity of the strain cultivated in a medium containing fowl-embryo tissues from which the head and spinal cord had been removed were most pronounced. The viscerotropic virulence of the virus was so reduced that when inoculated into monkeys only a mild generalized infection resulted, with minimal quantities of virus in the circulating blood. Probably as a result of the absence or scarcity of nervous tissue in the culture medium the neurotropism of the virus was also much diminished, and when inoculated intracerebrally into monkeys produced only a moderate febrile reaction followed by recovery and solid immunity. This change had a comparatively sudden onset, for at the 89th subculture the strain was highly neurotropic for monkeys, and still produced visceral infections with abundance of virus in the blood, but in the 114th subculture had lost both these properties. When injected intracerebrally into mice the mortality ratio was not diminished, but the time interval between inoculation and death was prolonged from an average of about 7 days at the 114th subculture to one of 9.8 days at the 176th subculture.

The changes in the pathogenicity of the strain cultivated for more than 160 subcultures in a medium containing testicular tissues were somewhat similar to those occurring in fowl-embryo tissue containing minimal amounts of nervous tissue. The viscerotropic properties were very reduced and only minimal quantities of virus appeared in the blood circulation of inoculated monkeys. When given intracerebrally, however, it produced death from encephalitis in monkeys. In mice the incubation period was also prolonged, but somewhat less so than in the case of the virus grown in fowl-embryo tissues without the central nervous system. E. H.

THEILER (Max) & SMITH (Hugh H.). The Use of Yellow Fever Virus modified by in Vitro Cultivation for Human Immunisation.—*Jl. Experim. Med.* 1937. June 1. Vol. 65. No. 6. pp. 787-800. [13 refs.]

The authors give details of the results of inoculating into monkeys varying amounts of the culture virus referred to above which had been grown in fowl-embryo tissue containing minimal quantities of nervous tissue.

The results indicate that the anti-body titre developed in monkeys bears no relation to the dose. Within 7 days monkeys inoculated subcutaneously with this tissue-culture virus are rendered immune to a subsequent injection of highly virulent yellow fever virus.

Four immune human subjects were inoculated with the culture virus and all showed a marked rise in antibodies; apart from a slight local reaction at the site of injection, no other symptoms were noticed. The antibody titre reached its maximum about the 4th to the 8th week and then slowly declined.

Eight normal persons have been vaccinated with this culture virus from the 227th and 229th subcultures. Five persons had a slight febrile reaction, with one exception between the 5th and 7th days, accompanied by slight headache and backache. Antibodies were present in the blood two weeks after vaccination, and in the case of two subjects examined at intervals, the titre was found to rise up to the 4th week but remained very low. The results are sufficiently encouraging to warrant a more extensive trial of the method.

E. H.

SMITH (Hugh H.) & THEILER (Max). The Adaptation of Unmodified Strains of Yellow Fever Virus to Cultivation in Vitro.—*Jl. Experim. Med.* 1937. June 1. Vol. 65. No. 6. pp. 801-808.

At first the authors without success made many attempts to cultivate four unmodified strains of yellow fever virus, using the technique employed by Haagen and Theiler for the Asibi strain [see this *Bulletin*, 1932, Vol. 29, p. 577]. Subsequently mouse embryos, about the 13th day of pregnancy, were inoculated with the virus *in utero* and a titration taken of the virus content of the different organs of the embryos. The results showed that the virus was present in the brain in greatest concentration.

Accordingly a medium was prepared consisting of minced mouse-embryo brain tissue and Tyrode solution containing 10 per cent. normal monkey serum. In this tissue unmodified strains of yellow fever virus were readily adapted to cultivation *in vitro*, including seven different strains ranging in pathogenicity from the highly virulent French strain to the recently isolated viruses from "Jungle Yellow Fever" which are low in both neurotropic and viscerotropic properties. Subcultures in mouse-embryo brain tissue medium were made at 3 to 5 day intervals, and after 20 to 25 subcultures the strains were readily adapted to cultivation in whole mouse-embryo tissue medium.

The prolonged cultivation of the virus in this brain tissue medium seems to have no effect on the neurotropic properties of the virus.

E. H.

JADIN (J.). Culture du virus de la fièvre jaune sur la membrane chorio-allantoidienne de l'embryon de poulet. [**The Culture of Yellow Fever Virus on the Chorio-Allantoic Membrane of the Fowl Embryo.**—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 27-32.]

After 6 to 7 days incubation fowls' eggs were inoculated with brain emulsions of mice infected with yellow fever, and after 4 or 5 days further incubation subsequently examined for the presence of virus. The results show that the virus multiplies in the tissues of the embryo and also extends into the surrounding albumen. Although in most cases the eggs were examined four or five days after inoculation, the virus was found to persist in the embryo up to the 18th day of incubation, but a chick of the same batch which was allowed to hatch contained no trace of virus.

The properties of the virus remained unaffected by culture in fowl embryos, and this would seem to be a very simple and practicable method of maintaining yellow fever virus. E. H.

ELMENDORF (John E., Jr. & SMITH (Hugh H.). **Multiplication of Yellow Fever Virus in the Developing Chick Embryo.**—*Proc. Soc. Experim. Biol. & Med.* 1937. Mar. Vol. 36. No. 2. pp. 171-174.

An independent account of the use of developing fowl embryos for the cultivation of yellow fever virus. The authors obtained similar results to those recorded by Jadin, but have simplified the technique of egg passage by inoculating the virus suspension directly into the embryo as seen by transmitted light.

Various strains of virus were successfully maintained in developing eggs. Sixty consecutive passages were made with a culture strain adapted to fowl embryo tissue, the optimum age of the incubated eggs being 7 to 8 days. The intervals between transfers varied from 2 to 8 days.

A strain adapted to mouse embryo tissue was also used and a similar multiplication of virus observed in the developing fowl embryos.

Four viscerotropic strains, two highly pathogenic ones from Africa and two from Brazil with only a mild degree of virulence, were successfully cultivated in this manner, but these unmodified strains were not so readily adapted to growth in the developing fowl embryo and in three cases repeated attempts were made before being successful. Once the strain had been carried through 2 or 3 passages no difficulty was encountered in continuing its propagation in this manner.

In one test a monkey inoculated with the French virus after 10 egg-to-egg passages died of typical yellow fever, showing there had been no modification in the virulence of the virus. In another test a culture strain, after 165 subcultures in fowl embryo tissue and 18 serial egg-to-egg passages, was inoculated into 4 monkeys, all of which developed protective antibodies against yellow fever. E. H.

FINDLAY (G. M.) & MACCALLUM (F. O.). **Attenuation of the Yellow Fever Virus by Growth in Tumours in Vivo.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 507-514. [14 refs.]

The authors succeeded in keeping three strains of yellow fever virus in mouse carcinoma 63 for periods varying from 6 to 15 months. Young

actively growing tumours were inoculated directly with 0.1cc. of a 10 per cent. suspension of the virus-containing material in serum saline. After 5 to 6 days the tumours were removed from the mice, a portion containing growing cells weighed, then ground up to form a 10 per cent. suspension as before and reinoculated into other actively growing tumours.

With a neurotropic strain after 400 passages in mouse brains, fifty passages in tumours were effected, without any alteration in character being observed. The virus in the primary inoculum was virulent in a dilution of 10^{-8} as compared with 10^{-10} in the 50th passage, therefore, the virus seems to have undergone active multiplication whilst in tumour tissue.

With pantropic tissue-culture virus, 60 passages were made in tumours and material from each passage tested by intracerebral inoculation into mice. No shortening of the incubation period was noticed. There was, however, a slight attenuation of virulence for the hedgehog as tested by the subcutaneous inoculation of 9 animals.

The ordinary pantropic, or viscerotropic virus, was found to show a gradual loss in pathogenicity as tested by inoculations into various animals. In mice inoculated intracerebrally there was a gradual reduction in the incubation period until about the 40th tumour passage when it became stabilized at 7 to 8 days. After 10, 20, 40 and 60 passages respectively, rhesus monkeys and hedgehogs were inoculated subcutaneously with infected tumour material and showed a profound loss of pathogenicity, all 6 monkeys after the 40th and 69th passages surviving without showing any fever, yet developing immunity and the last 4 hedgehogs all surviving. This diminution in pathogenicity was not accompanied by any increase in neurotropism as shown by the results of mouse inoculations.

Yellow fever virus seems to have a special affinity for neoplastic cells, since localization in the cells of the mouse tumour occurs after subcutaneous or intraperitoneal inoculation of the virus. *E. H.*

HOFFMANN (W. H.). Die Bedeutung der anatomischen Gelbfieberdiagnose. [**The Importance of the Anatomical Diagnosis of Yellow Fever.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 195–204.]

An article calling attention to the importance of the histological examination of all patients dying after a sudden attack of fever of short duration. Also in view of the fact that approximately 8,000,000 square miles in Africa and South America show serological evidence of the disease, it is evident that in any outbreak histological diagnosis of the infection is of the highest value. *E. H.*

LYNCH (Clara J.) & HUGHES (Thomas P.) **The Inheritance of Susceptibility to Yellow Fever Encephalitis in Mice.**—*Genetics.* 1936. Mar. Vol. 21. No. 2. pp. 104–112.

Mice from two sources gave different mortality rates when inoculated with the virus of yellow fever, a difference which was maintained in three separate tests. When the strains were crossed the hybrids showed a mortality less than that of the susceptible strain. In one

test the difference was clearly significant and in another it was probably significant. By crossing the hybrid back to the susceptible strain the mortality rate was increased, but by crossing back to a more resistant strain the rate was lowered. This relationship was demonstrated in two tests. When the mice were classified according to parentage, offspring from two susceptible parents were more susceptible than were offspring with one or two resistant parents. Susceptibility did not appear to be modified by sex. Although hereditary factors for resistance to yellow fever encephalitis are present in mice the mode of inheritance is not clear for neither fluctuating variations nor the joint occurrence of a number of genes can be ruled out by the data presented.

G. M. Findlay.

STAGE (H. H.) & YATES (W. W.). **Some Observations on the Amount of Blood engorged by Mosquitoes.**—*Jl. Parasitology*. 1936. June. Vol. 22. No. 3. pp. 298-300.

In the course of certain field work near Portland, Oregon, an unusual opportunity occurred for estimating the amount of blood engorged by *Aedes vexans* and *Aedes aldrichi*, enormous numbers of which fed upon a horse. Groups of unfed and of fully engorged females were weighed, on an analytical balance, within a few hours of capture. Each engorged *Aedes vexans* contained 0.002077 ± 0.00012 gram of blood, and each engorged *Aedes aldrichi* contained 0.002107 ± 0.000124 gram.

Norman White.

MANTEUFEL (P.). Neuere Untersuchungen ueber das vermeintliche Gelbfieberbakterium *B. hepatodystrophicans* von Kuczynski. [**Later Studies on the Supposed Yellow Fever Bacterium, *B. hepatodystrophicans* of Kuczynski.**]—*Zent. f. Bakt.* I. Abt. Orig. 1937. Feb. 16. Vol. 138. No. 5/6. pp. 306-309.

The author, with HERZBERG, previously stated that this organism was identical with *B. renale* (see this *Bulletin*, 1931, Vol. 28, p. 729). As a result of further investigations this organism has been found in the livers and kidneys of cattle, sheep and pigs, as well as rabbits. In addition to yellow fever, joint rheumatism and other diseases have been supposed to be due to its agency. It would seem to be a very wide-spread organism in the blood circulation of man and animals, and is probably identical with *B. lymphophilum* Torrey 1916, and with *Coccobacillus diphtheroides* Collis. It is most closely related to *B. bifidum* of Tissier and probably has a similar physiological significance.

E. H.

SEIFFERT (Gustav). Zur Epidemiologie des Gelbfiebers. (Neue Forschungen und praktische Ergebnisse.) [**The Epidemiology of Yellow Fever. New Investigations and Practical Results.**]—*Muench. Med. Woch.* 1937. Feb. 19. Vol. 84. No. 8. pp. 298-301.

A general summary of recent information on the subject containing nothing new.

E. H.

FINDLAY (G. M.). Die Immunisierung gegen das Gelbfieber. [Immunization against Yellow Fever.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 185-188.

A general summary of various methods used in immunization against yellow fever, together with notes on the different types of virus.
E. H.

HAAGEN (E.). Das Gelbfieber. [Yellow Fever.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Feb. Vol. 41. No. 2. pp. 188-193.

A general account of certain properties of yellow fever virus containing nothing new.
E. H.

BABLET (J.). La prémunition de la fièvre jaune: réalisations et promesses? [Premunition against Yellow Fever. Realizations and Promises?]—*Rev. d'Hyg. et de Méd. Préventive.* 1937. May. Vol. 59. No. 5. pp. 321-338. [72 refs.]

A general review of the subject.
E. H.

BABLET (J.). L'étiologie et l'épidémiologie de la fièvre jaune: conception anciennes. Acquisitions récentes.—*Rev. d'Hyg. et de Méd. Préventive.* 1937. June. Vol. 59. No. 6. pp. 443-465. [52 refs.]

RELAPSING FEVER AND OTHER SPIROCHAETOSSES.

ADLER (S.), THEODOR (O.) & SCHIEBER (H.). **Observations on Tick-transmitted Human Spirochaetosis in Palestine.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 25–35.

The authors have previously recorded the existence of tick-transmitted relapsing fever in Palestine (see this *Bulletin*, 1936, Vol. 33, p. 693) and in the present paper give details of their observations.

Records of 45 cases of the fever, associated with caves, have been collected since 1927; 19 came under their personal observation and the others are from hospital records in Emek Jezreel. Thirteen cases were traced to a single cave near Caesarea; 17 from the neighbourhood of Nazareth; 3 from the foot of Mount Carmel; 1 from upper Galilee and 2 from lower Galilee, so the infection is evidently widely distributed.

In one outbreak, 11 children traced a porcupine to a cave near Kfar Vitkin and whilst 2 watched outside the other 9 entered the cave and remained there two hours. All these 9 children became infected, as did 2 other men who visited the cave later and were bitten by large numbers of the larvae of *Ornithodoros papillipes*.

The incubation period varies from 5 to 9 days, 7 or 8 being the commonest. As a general rule there are one, two, or three attacks, but cases occurred with as many as 14 attacks and all intermediate numbers. The duration of the attacks varies from 3 hours to 4 days, although one case lasted for 19 days; the temperature curves were not typical.

In every attack spirochaetes were present in the blood and the temperature rose to 37·8° to 40°C. Some attacks were accompanied by nausea, vomiting, headache, and pain in the eyes and joints. Neuritis of the sciatic nerve was noted in one case and ocular changes in two. The disease was unaffected by doses of 0·3 to 0·75 gm. neosalvarsan and *Spirochaeta sogdianum*, the causative agent, would seem to be naturally arsenic-resistant.

Ornithodoros papillipes was found to be the transmitting agent both by field observations and also in laboratory transmission experiments. The tick does not pass coxal fluid whilst feeding and therefore this fluid, although infective, is not responsible for producing infection.

All stages of the tick, including the larvae, were found to transmit the infection by bite, and spirochaetes were found in puncture wounds made by infected ticks in man and a rat, 39 and 67 days after the infecting feed. The spirochaetes pass from infected female ticks to the eggs, but not all larvae are infective. E. Hindle.

MORRISON (R. J. G.). **Some Cases of Relapsing Fever in Palestine.**—*Jl. Roy. Army Med. Corps.* 1937. Feb. Vol. 68. No. 2. pp. 86–94. With 2 figs. & 4 charts.

An account of 4 cases of relapsing fever admitted to the Reception Station, Jerusalem. All the patients were soldiers belonging to the same battalion who had spent a night in an open cave or dug-out and became ill on the 6th or 7th day afterwards. Spirochaetes were

found in the blood of 3 of the patients and although they could not remember having been bitten by lice or ticks, the history of the cases and the results of animal experiments indicate that the infection was probably tick fever, caused by *S. sogdianum*. Guinea-pigs were susceptible to the infection and also pigs, white mice and rabbits.

Details are given of the clinical history of these cases and attention called to the resemblance to sand-fly fever. However, if the patient is under observation the relapsing nature of the fever is characteristic. Spirochaetes were often difficult to find, even when the temperature was high, but seem most likely to be found during the first febrile attack.

E. H.

BECK (M. Dorothy). **California Field and Laboratory Studies on Relapsing Fever.**—*Jl. Infect. Dis.* 1937. Jan.-Feb. Vol. 60. No. 1. pp. 64-80. With 1 fig. & 3 charts. [23 refs.]

A general account of field and laboratory studies on relapsing fever in California conducted over a period of three years. The disease is shown to be endemic, 106 cases having been reported from 1921 to 1935. Nine foci of infection have been found in mountainous districts over 5,000 feet high, the most important ones being Big Bear Lake, Lake Tahoe and Packer Lake.

Thirteen strains of spirochaetes resembling *S. recurrentis* have been isolated from chipmunks and Tamarack squirrels (Sierra chickaree) in the field, by subinoculations into mice. In addition six human strains were isolated. Rabbits were found to be more or less refractory to infection although some individuals showed spirochaetes for single days. In guinea-pigs considerable variation was met with in different strains; one human strain produced a non-apparent infection, with the blood infective to mice on the 9th, 23rd and 43rd days. Another human strain failed to infect, whilst two chipmunk strains both produced infections with spirochaetes present in the blood for periods up to 8 and 19 days respectively. Brain infections were found to persist in mice up to 114 days after the original infection.

The spirochaetes were found to show remarkable resistance to freezing and even in the tissues of dead animals and in clotted blood would persist for some days. In defibrinated sheep's blood kept in ice they remained viable for at least 195 days.

Hyperimmune guinea-pig serum was produced against both chipmunk and Tamarack squirrel strains of spirochaetes. Protection was obtained with homologous and heterologous strains and in one instance protection was shown with antiserum produced from a rodent strain against inoculation with a human strain.

The rodent and human strains were found to be identical in morphology and produced similar effects in laboratory animals, and in view of the direct transmissibility of the rodent strains to man there can be no doubt of their identity.

E. H.

BRUNS (A.). Ueber Rückfallfieber in Abessinien. [**On Relapsing Fever in Abyssinia.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Mar. Vol. 41. No. 3. pp. 343-348.

A general account of the disease based on a study of 351 cases in various parts of Abyssinia.

Relapsing fever is endemic in many districts and in addition epidemics may occur, but are confined to the rainy season. In Addis Ababa most of the cases occur in July, August and September, but odd cases occur throughout the whole year.

The question as to whether lice or ticks are the carriers is a little uncertain. In south-east Abyssinia the infection is transmitted by *Ornithodoros moubata*, but also has been shown capable of transmission by the louse. In Eastern Abyssinia the carrier is *Ornithodoros savignyi*; in British Somaliland, *O. moubata*; and in Italian Somaliland both these species have been incriminated and also the louse.

The very fatal epidemic occurring in Djig-Djiga during 1929, at the height of which the number of deaths reached 40 to 50 daily among a comparatively small force of 600 Abyssinian soldiers and a few thousand inhabitants, is stated by the authors to have been transmitted by lice.

Details are given of the clinical symptoms of the disease, which varies considerably in its mortality, depending mainly on the presence or absence of other infections and the general health of the patient. As a rule the average mortality is about 10 per cent.

Although tick transmitted cases of relapsing fever are not infrequent, the disease seems to be generally transmitted by lice and the usual methods of prophylaxis are effective. E. H.

SIBILIA (Daniele). Primo contributo alla conoscenza della spirochaeta recurrentis osservata in Addis Abeba. [**Relapsing Fever in Addis Ababa.**—*Policlinico*. Sez. Prat. 1937. Apr. 19. Vol. 44. No. 16. pp. 772-776. [20 refs.]

The author has had under his observation forty cases of relapsing fever during the early months of the Italian occupation of Addis Ababa. The spirochaetes seen in smears were, he thought, of the Obermeier type, varying in length from 10-45 μ , but more slender than usual, 0.25 μ mostly. Many were quite short, 4-10 μ only. The vector was the louse. He remarks that louse-borne relapsing fever has not previously been recorded in the territory, the usual being the tick-borne *duttoni* type. H. H. S.

CLARK (E. M.). **Report on Relapsing Fever in Burao.**—*Somaliland Protectorate Ann. Med. & San. Rep. for Year ending 31st December, 1936*. Appendix II. pp. 57-66. With 2 graphs.

An interesting account of relapsing fever in Burao, Somaliland, where the disease in recent years has become a serious problem.

It is supposed to have spread from Abyssinia, and was first noted in Burao in 1927. The number of cases rose from 13 in 1929, up to 100 or more in 1932, 500 in 1933, and 618 cases in 1936. The number of cases begins to rise each year from April to September, after which there is a rapid fall. The population is lowest during these months and there is no obvious explanation of this seasonal prevalence of the disease.

The disease is of a mild type, and out of 981 treated cases there have been only 6 deaths; but untreated cases have a higher mortality and it is estimated that annually about 50 to 100 people die of relapsing fever out of a population of approximately 15,000.

The vector seems to be mainly *Ornithodoros savignyi*, which has a very localized distribution, but is to be found under many of the trees, especially where stock is tied, as well as in the houses and Haafa town. The disease started in the largest mosque in the town, and as this was used as sleeping quarters for a changing population, it must have acted as a focus for the spread of infection. The ticks inhabit loose sand and not matting, so by moving the sites of infected camps it should be possible to reduce the incidence of the disease.

In a note signed by Dr. J. C. R. Buchanan, it is pointed out that DRAKE-BROCKMAN, the first to report Relapsing Fever in British Somaliland [see this *Bulletin*, 1914, Vol. 3, p. 4] predicted a spread to Berbera, but fortunately this did not prove a true prophecy, and now the disease seems to have disappeared from the coast. E. H.

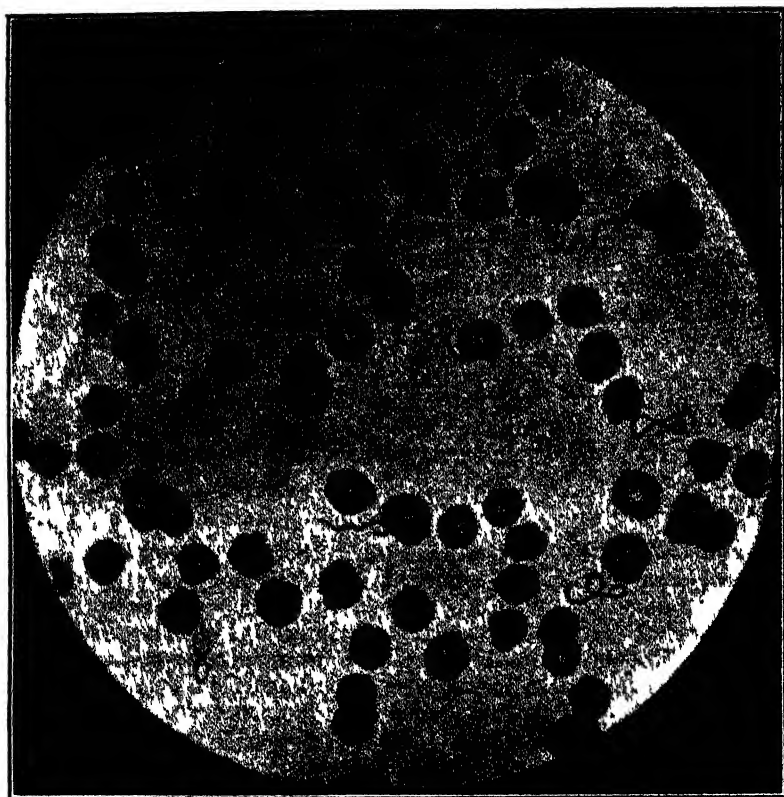
MODUGNO (Gastone). La febbre ricorrente in Somalia. Osservazioni cliniche ed epidemiologiche. [*Relapsing Fever in Somalia. Clinical and Epidemiological Observations.*]—*Giorn. Ital. di Clin. Trop.* 1937. Feb. 28. Vol. 1. N.S. No. 2. pp. 35-6, 39-42. With 6 charts.

Between 28th July and 10th November, 1935, there were 142 cases of relapsing fever in Somalia coming under the author's notice; 92 were proved by blood examinations. Most of the cases were fairly typical but in some the symptoms were strongly indicative of bilious remittent malaria. Twenty showed severe symptoms during the apyrexial period, and two had a marked meningeal reaction—rigidity of the neck, Kernig's sign positive—but the prognosis was favourable; most of the cases were mild and there were only three deaths. *Ornithodoros moubata* was not found, but lice were common.

H. H. S.

TADDIA (Leo). Febbre esantematica da spirochete in Somalia. [*Spirochaetal Fever in Somalia.*]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Feb. Vol. 18. No. 2. pp. 106-110. With 1 chart & 1 fig.

The patient, a soldier of unknown age, complained of headache, weakness, loss of appetite, photophobia and lumbar pain. His temperature ranged between 39° and 40·4°C. for 5 days, spleen a little enlarged, albuminuria present and a polymorphic rash over face, chest and arms. The temperature then came down by crisis and for 7 days there was no fever, but a feeling of debility, and desquamation occurred on the site of the rash. Then the temperature rose rapidly to 40·2°, falling again to normal, the fall being accompanied by a profuse sweating; the following day this rise and fall were repeated. During the febrile period examination of the blood revealed filiform bodies 8-24 μ or even to 30 μ in length and 0·3 μ broad, as many as 5 or 6 in a field. What these are is not known. The fever is not like ordinary relapsing fever and the filiform bodies are not like *Sp. obermeieri* [the illustration shows them to resemble very minute filarial embryos, in the disposition of their curves]. There was during the fever "intense leucocytosis with polynucleosis" [but no figures are given]. H. H. S.



Microphotograph of blood showing filiform bodies from patient diagnosed as suffering from spirochaetal fever in Italian Somalia
[IADDIA'S paper]

[Reproduced from the *Archivio Italiano di Scienze Mediche Coloniali e di Parasitologia*]

RAMIJEAN (R), HUONG (N V) & FARINAUD (M) Deux cas de fièvre récurrente dans la région Saïgon-Cholon [**Two Cases of Relapsing Fever in the Saïgon-Cholon Region.**]*—Bull Soc Path. Exot* 1937 Mar 10 Vol 30 No 3 pp 220-224

For many years an average of 50,000 blood films have been examined in this region without finding any trace of spirochaetes and therefore the sudden occurrence of two cases of relapsing fever among Chinese immigrants presents some interest from an epidemiological point of view

After considering the evidence the authors are of the opinion that both cases acquired the infection from infected lice either derived from an undetected carrier who had passed through the Immigration, or, in view of the incubation period in lice, the patients may have carried lice with them from China, and these insects produced the infection after their arrival in Saigon

E H.

RAMIJEAN (R.), FARINAUD (M. E.) & TRAN-VAN-TAM. Deux cas de fièvre récurrente dans la région Saigon-Cholon. [**Two Cases of Relapsing Fever in the Saigon-Cholon District.**].—*Bull. Soc. Méd.-Chirurg. Indochine*. 1937. Feb. Vol. 15. No. 2. pp. 133-140. With 2 charts.

A more detailed account of the cases previously recorded [see above].

E. H.

CUNNINGHAM (J.) & FRASER (A. G. L.). **Further Observations on Indian Relapsing Fever. Part III. Persistence of Spirochaetes in the Blood and Organs of Infected Animals. Part IV. Re-Infections and Super-Infections.**—*Indian Jl. Med. Res.* 1937. Jan. Vol. 24. No. 3. pp. 571-580. [61 refs.]; 581-592. [15 refs.]

i. Using squirrels infected with *S. carteri*, the authors have attempted to prove, by means of subinoculations, the presence or absence of spirochaetes in the tissue after varying periods, and also to determine the type of spirochaete recovered. The results indicate that residual infections, and particularly invasion of brain tissue, do not occur with the Indian louse-borne strain. The infected animals maintain spirochaetes in the blood and internal organs throughout the interval between the first and second attacks, and the spirochaete recovered during the interval always differs in type from that of the primary attack. The serological examination of the blood, carried out at various periods during and subsequent to infection, bears out the conclusion that the disease in most cases consists essentially of a succession of invasions by different types of spirochaetes which vary in intensity and duration, the essential difference between cases showing single attacks from those with relapses, being only one of degree, in that later attacks are latent in one case and demonstrable by blood examination in the other.

ii. The agglutinin content of the serum of five monkeys infected with different serological types of *S. carteri* was tested at 30-day intervals, and antibodies found in the blood for periods up to 19 months after the primary infection. With the disappearance of antibody the animals become completely susceptible to re-infection. When antibody is present the success or failure of re-infection depends upon the size of the dose, the type of spirochaete, and the concentration and types of antibody produced by the primary infection. Under ordinary conditions re-infection will fail when sufficient antibody to the type of spirochaete used for re-infection is present in the blood, but when the antibody is absent or insufficient, re-infection can readily be obtained. A rapid and considerable increase in the corresponding antibody content of the blood is produced by re-infection with either homologous or heterologous types.

Superinfections follow the same general rules and whilst antibodies from the primary infection are present in the blood, superinfections are only successful with heterologous types. During its course such an infection can be distinguished from the different stages of the primary infection by serological tests, even when it has been

superimposed during the first attack. The clinical appearances depend upon the particular stage of the disease chosen for superinfection

E.

ADLER (S.) & ASHBEL (Riwkah). **Observations on *Spirochaeta sogdianum* Nicolle and Anderson, 1928, in Laboratory Animals.** *Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 89-104. With 9 figs. on 2 plates.

A detailed study of 6 strains of *Spirochaeta sogdianum*, one obtained by feeding wild ticks, *O. papillipes*, on a guineapig, and the other 5 from 4 human cases. Two strains were obtained from the same case (4th and 10th relapses).

The spirochaete was found to be infective for mice, rats, field-mice (*Microtus guentheri*), guineapigs, rabbits and dogs. In splenectomized rats and field-mice the infection was heavier and more prolonged than in normal animals. The fluid from the anterior chamber of the eye was found to be infected, and also the spirochaetes can pass through the placenta of the guineapig and infect the offspring. Guineapigs were found to be the most suitable host and out of 290 individuals only two were refractory. The spirochaete is strongly neurotropic and in guineapigs that have passed through even a slight infection the spirochaete persists in the brain up to at least 130 days after recovery. Guineapigs that have passed through a moderate or severe infection are immune to reinfection with the same strain, but can be reinfected by any other strain. Even the two strains isolated from the same human case (4th and 10th relapse) could be distinguished by their cross-immunity and agglutination tests.

Convalescent sera, in addition to agglutinating and immobilizing homologous spirochaetes, contain a specific factor which causes these organisms to attach themselves to lymphocytes, mononuclears and polymorphs, and to the nuclei of these cells after disintegration of their protoplasm. This factor causes the entrance of spirochaetes into polymorphs in the complete absence of phagocytic activity. Convalescent sera have no curative or prophylactic value. E. H.

FENG (Lan-Chou) & CHUNG (Huei-Lan). **Attempts to infect *Ornithodoros moubata* with the Chinese Strain of *Spirochaeta recurrentis*.** *Proc. Soc. Experim. Biol. & Med.* 1937. Apr. Vol. 36. No. 3. pp. 330-333.

Four lots of young larval *Ornithodoros moubata* and adult male and female specimens, were fed on squirrels heavily infected with the Chinese strain of *Spirochaeta recurrentis* and subsequently fed on normal squirrels and also examined for spirochaetes.

The feeding experiments were uniformly negative and at 25-28°C. the spirochaetes both in the guts of the ticks and also in the coelomic fluid degenerated and finally disappeared about 6 days after the infecting feed. The injection of emulsions from these ticks also failed to infect squirrels.

These findings suggest that the Chinese strain of relapsing fever is biologically different from those transmitted by ticks and also from the Russian and American strains, which seem to be transmissible by *O. moubata*. E. H.

WERNBERGER (R.). Les rats d'Alger réservoir de virus de la fièvre écurrente hispano-africaine. [*Rats as a Reservoir of Spanish-African Relapsing Fever in Algiers.*—*Arch. Inst. Pasteur Algérie*. 1936. Dec. Vol. 14. No. 4. pp. 421-423.]

The author gives the results of an examination of 23 lots of 10 rats caught in Algiers during 1933 and 1934. Among these 23 lots, 22 were found to be infected with *S. hispanicum* as determined by inoculation of brain emulsions of the rats into guineapigs. It is assumed that probably only one rat in each of these three lots was infected, giving an infection rate approximately the same as that found by SERGENT—one out of 90.

E. H.

LEPTOSPIROSIS.

LUMLEY (George F.). *Leptospirosis in Queensland: a Serological Investigation leading to the Discovery of Distinct Serological Groups of Leptospirae causing Leptospirosis as it occurs in Northern Queensland, with Some Other Related Observations.*—*Med. Jl. Australia*. 1937. May 1. 24th Year. Vol. 1. No. 18. pp. 654-664. [40 refs.]

A detailed study of strains of leptospira isolated from man and rat in the Ingham-Innisfail area of northern Queensland.

The results show the existence of two separate and distinct serological groups, tentatively named Group Australis A and Group Australis B.

Cross-agglutination tests with the sera of 24 patients showed that 10 belonged to group A and 14 to group B. Each group contains both human and rat strains, and it would appear that the passage of rat strain through man does not materially alter its agglutination properties. These two strains are not related to the Pomona strain [see below] nor to Strain R. 102 from southern Queensland. Neither are they related to any of nine water strains isolated from Ingham water. Australis A is not related to any of the over-sea strains examined, but Australis B was found to be distantly related to *L. icterohaemorrhagiae* (Wijnbergi, Netherlands) and to *L. canicola* (Wubbeling). Both A and B cultures have been kept in cultures more than 18 months without showing any alteration in their agglutination characteristics, the preservation of which does not seem to require frequent passaging through guineapigs to maintain virulence.

Stocks of leptospiral antiserum prepared in England against ordinary infections, did not agglutinate Australis A and had little effect on Australis B and it is evident that an active antiserum for local use would have to be made from these two strains. Attention is called to the allergic reactions that may occur after the administration of anti-leptospiral serum.

In addition to the existence of these two well marked types of infection, there is a suggestion that sub-types of *Leptospira icterohaemorrhagiae* and perhaps *L. canicola* may be present.

E. Hindle.

CLAYTON (G. E. B.) & DERRICK (E. H.). **The Presence of Leptospirosis of a Mild Type (Seven-Day Fever) in Queensland. With a Foreword by Raphael CILENTO.**—*Med. Jl. Australia.* 1937. May 1. 24th Year. Vol. 1. No. 18. pp. 647-654. With 5 charts.

The description of a case of seven-day fever occurring in a patient living near Pomona, South Queensland. This is the first record of the existence in Australia of mild strains of leptospirosis similar to those existing in other countries. The authors diagnosed the case clinically, from the similarity of the symptoms to those of the seven-day fever of the East, and succeeded in isolating a leptospira from the patient's blood which in guineapigs showed a much lower virulence than the ordinary strain of *L. icterohaemorrhagiae*. Thus 20 out of 22 animals inoculated with the Pomona strain survived, whilst 10 out of 11 died when infected with the ordinary Weil strain in Queensland.

Details are given of the infection in guineapigs, and it is shown that the carrier condition may develop in these animals, one guinea-pig showing leptospira in its urine 114 days after inoculation. Two wild rats were inoculated but showed no obvious signs of infection; yet when respectively 8 and 20 days after inoculation the liver and kidney of these animals were injected into guineapigs, these became infected.

Cross-agglutination tests showed that the Pomona type is distinct from the ordinary Weil's disease strain, but some slight degree of cross protection was obtained with the Ballico strain. Comparison with foreign strains showed that it is related to the Rachmat and Baermann strains from Sumatra.

The authors produce clinical evidence in support of the view that an endemic centre of this disease occurs in Queensland, about 700 miles further south than the area affected by the more severe type of leptospirosis.

E. H.

SCHÜFFNER (W. A. P.) & WALCH-SORGDRAGER (B.). Infection humaine par *Leptospira canicola*. [**Human Infection with *L. canicola*.**—*Bull. Office Internat. d'Hyg. Publique.* 1937. Feb. Vol. 29. No. 2. pp. 297-306. With 2 charts.

A description of two new cases of human infection with the dog strain of leptospira, *L. canicola*, observed during 1936.

The serum reaction of the first case gave agglutinations of 1 : 100 against *L. icterohaemorrhagiae* as compared with 1 : 3,000 against *L. canicola*; the urine remained negative. In the second case the titre rose to 1 : 10,000 against *L. canicola* and was only 1 : 300 against *L. icterohaemorrhagiae*. A strain of *L. canicola* was obtained by inoculation of the urine into a guinea-pig, which showed a very benign infection. In this case the source of infection was probably a dog owned by the patient's family, which showed an agglutination of 1 : 30,000 against *L. canicola* and only a doubtful reaction in 1 : 10 dilution against the ordinary strain.

The authors give a brief summary of the three European leptospiroses which are well defined by their clinical, bacteriological and epidemiological characters. The first of these is the ordinary Weil's disease caused by *L. icterohaemorrhagiae*, and is spread throughout the world; the second type caused by *L. canicola*, a dog strain, up to

now has been found only in Holland ; the third is the so-called " Slime Fever," which causes symptoms resembling an intestinal form of influenza.

E. H.

CHODZKO (W.). Spirochétose ictéro-hémorragique en Pologne. [*Spirochaetal Jaundice in Poland.*]—*Bull. Office Internat. d'Hyg. Publique.* 1937. Feb. Vol. 29. No. 2. pp. 307–316. [25 refs.]

A general summary of observations on Weil's disease in Poland, in which it is mentioned that 15 cases have been recorded there, of which one was a laboratory infection, with 5 deaths. The patients were all males who became infected during the summer, and in 9 of them the symptoms developed soon after bathing in the open air. Although up to the present, no epidemics have been noted, in view of its economic importance and the efficiency of methods of protection, the author considers that all cases of infection and deaths should be notified to the public authorities.

E. H.

RIMBAUD (L.), JANBON (M.) & LABRAQUE-BORDENAVE. Trois cas de spirochétose ictéro-hémorragique chez des mineurs. [*Three Cases of Weil's Disease in Miners.*]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1937. May 17. 53rd Year. 3rd Ser. No. 16. pp. 604–610.

A description of three typical cases of Weil's Disease occurring in coal miners at Rochebelle, Alès (Gard). Attention is called to the importance of the manner in which the urea is eliminated by the urine. In these cases the azoturic crisis commenced respectively on the 15th, 16th and 11th days of the disease, and very soon reached its maximum, in two cases the amount of urea reaching 68 gm. per 24 hours. The authors are of the opinion that the hyperazotaemia occurring in this disease is for the most part extra-renal.

E. H.

RIMBAUD (L.), JANBON (M.) & LABRAQUE-BORDENAVE. Deux cas atypiques de spirochétose ictéro-hémorragique. Formes anictériques [pseudo-grippale et méningo-rénale]. [*Two Atypical Cases of Weil's Disease. Forms without Jaundice Pseudo-Influenzal and Meningo-Renal.*]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1937. May 17. 53rd Year. 3rd Ser. No. 16. pp. 610–615.

A description of the clinical symptoms of two atypical cases of Weil's disease occurring in Montpellier, where the disease is rare. Neither case showed signs of jaundice, or haemorrhages, and the method of infection remained obscure. The first closely resembled a case of influenza, but its nature was determined by the systematic examination of the urine which showed a polyuric crisis, and by sero-diagnostic tests.

The second case showed a febrile syndrome with vomiting, then a morbilliform erythema, and a secondary meningitic syndrome with hyper-leucocytosis (216 elements) of the cerebrospinal fluid. It gave a strongly positive sero-diagnostic reaction against *S. icterohaemorrhagiae*.

E. H.

BEWLEY (G.) & WILSON (J. G.). A Case of Weil's Disease.—*Irish Jl. Med. Sci.* 1937. Mar. 6th Ser. No. 135. pp. 123-125.

A clinical description of a case of Weil's disease which developed 14 days after the patient had been bitten by a rat. Although the inoculation of urine into a guineapig was negative, the patient's serum agglutinated a formalinized culture of *Spirochaeta icterohaemorrhagiae* in all dilutions from 1/10 to 1/30,000. A second case of this disease is recorded from Ireland in which the patient, who had a cut foot, bathed in a pool in a rat-infested area in Baldonnel. E. H.

VAUCEL (M.) & SOULIER (R.). Sur l'existence d'un foyer de leptospirose à Tuyen-Quang (Tonkin). [On the Existence of a Centre of Leptospirosis at Tuyền-Quang (Tonking).]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 408-416.

A study of a centre of leptospirosis in the middle region of Tonking, discovered by means of sero-diagnostic tests, and its nature confirmed by the isolation of a leptospira morphologically identical with *S. icterohaemorrhagiae*.

Serum reactions, in which 10 strains of leptospira were used, gave 54 positive results out of 195 patients. Of these *S. icterohaemorrhagiae* was agglutinated preferentially 42 times; *S. autumnalis* 4 times; *S. Kebler (autumnalis?)* twice; whilst *S. hebdomadis* and *S. Tuyền-Quang* were never agglutinated preferentially. In six cases the agglutination was equal for two different species.

The organism isolated was pathogenic for guineapigs, and agglutination and other tests indicate that it was related to both *S. Tuyền-Quang* and *S. icterohaemorrhagiae*.

Only 10 per cent. of the patients showed typical clinical signs of the infection, and the great majority arrived at the hospital for malaria or other ailments.

In cases of simple leptospirosis the proportion of positive serum diagnoses did not exceed 60 per cent. and in other patients showing less well marked symptoms the positives were only about 25 per cent. The extreme specificity of the antigens, and the persistence of agglutinins, together limited the value of sero-diagnostic tests for the infection.

There was no correlation between any strain of leptospira and any particular clinical type. E. H.

VAUCEL (M.). Leptospiroses anictériques au Tonkin. [Leptospiroses without Jaundice in Tonking.]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Oct. Vol. 14. No. 8. pp. 1115-1131. With 10 charts.

The author has collected observations on 10 cases of leptospiral infection in which jaundice was absent. In 9 cases, agglutination and inoculation tests showed that the infection was *L. icterohaemorrhagiae*, whilst in one case the spirochaete was very distinct, but is classified under the *L. autumnalis* group.

Although these cases clinically resembled similar cases in Japan, the Dutch East Indies and also in France, it was found very difficult to establish any precise diagnosis by means of agglutination tests and it is evident that in Tonking there are antigenic differences between the

various strains of *L. icterohaemorrhagiae*. It is certainly the same for *L. autumnalis* and *L. hebdomadis* and the author insists on the necessity of using several strains including locally isolated ones, in making agglutination tests.

E. H.

VAUCEL (M.). Séro-diagnostic des leptospiroses au Tonkin agglutinines et co-agglutinines. [The Sero-Diagnosis of Leptospiroses in Tonking. Agglutinins and Co-Agglutinins.]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 176-186. [15 refs.]

The author has made 643 sero-diagnostic tests during 1936 on patients in Tonking, with the following results:—

- (1) 21.8 per cent. positive in 329 patients suspected of leptospirosis.
- (2) 4.05 per cent. positive in 164 patients with indeterminate fever.
- (3) 11.8 per cent. positive in 137 patients whose serum had been forwarded for Wassermann tests.
- (4) 15.3 per cent. positive in 13 patients infected with pyomyositis.

Four strains of *L. icterohaemorrhagiae* isolated from rats in Hanoi, as well as Japanese strains of this species and of *L. autumnalis* and *L. hebdomadis*, were used for their reactions.

With reference to *L. icterohaemorrhagiae*, 36 per cent. of the cases agglutinated all the strains, 33 per cent. showed very different degrees of activity against the various strains, and 10 per cent. of the cases reacted only with one particular strain.

Out of 92 positive sera, 48 agglutinated *L. autumnalis*, and 4 of these were negative with all other strains, 5 sera agglutinated *L. autumnalis* at higher dilutions than *L. icterohaemorrhagiae*, 3 sera agglutinated the two at equal dilutions, and in 36 sera the titre of *L. autumnalis* did not exceed 1:100 as compared with much higher titres in the case of strains of *L. icterohaemorrhagiae*. Up to the present no serum has been found which agglutinated *L. hebdomadis* exclusively, or in a higher titre than that of the strain with which it was associated.

A zone phenomenon was observed in 77 per cent. of the positive sera in titres below 1:1,000, but was present in only 2 per cent. of the sera with titres of 1:1,000 or higher.

The serum of guineapigs surviving a single inoculation of the products of leptospiral cultures, develop agglutinins and facilitate the biological diagnosis of leptospirosis.

E. H.

T'ANG TZE-KUANG. The Occurrence of Weil's Disease in Canton, China.—*Chinese Med. J.* 1937. Apr. Vol. 51. No. 4. pp. 483-488. With 1 plate.

A description of three typical and fatal cases of Weil's disease in Canton, the first record of its occurrence in China.

The blood of one patient was inoculated into guineapigs, and reproduced the infection, leptospira being found in sections of the organs. From the data concerning another patient the disease could be traced back to an epidemic in the City Detention Home, resulting in more than 100 deaths within three to four months, and only terminated when the inmates were removed to new quarters. The clinical features of these cases were all typical, with jaundice, late subcutaneous haemorrhages, cerebral symptoms and fulminating course ending in death.

E. H.

BIGOT (A.). Observation clinique d'un cas de spirochétose ictéro-hémorragique. [Clinical Observations on a Case of Weil's Disease.]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1936. Oct. Vol. 14. No. 8. pp. 1132-1136. With 1 chart.

A detailed account of the symptoms of a fatal case of infection with a spirochaete morphologically resembling *L. icterohaemorrhagiae*. The patient showed a descending febrile attack which rose very suddenly before death. Other symptoms were vomiting, muscle pains, and a slight yellowish tinge. There was a marked rise in the urea content of the blood, albuminuria, and increased tension of the cerebrospinal fluid. E. H.

LESNÉ (E.), TROISIER (J.) & BÉNARD (H.). Une spirochétose nouvelle. [A New Spirochaetosis.]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1937. Mar. 22. 53rd Year. 3rd Ser. No. 10. pp. 368-374. With 4 figs.

The patient, a girl 13 years old, entered hospital with diffuse abdominal pains, accompanied by vomiting and constipation. Febrile symptoms continued for about 3 weeks with temperatures oscillating daily between 38° and 39°C., terminating with complete recovery after defervescence with lysis. The symptoms being suggestive of appendicitis, laparotomy was performed, but the removed appendix showed no signs of infection.

The spirochaete obtained by blood culture, when inoculated intravenously into two human subjects and a monkey, after an incubation period of 4 to 8 days produced a marked febrile attack (40°C.) lasting for 1 to 2 days followed by recovery without any relapses. The organism, named *S. haemophilus* [sic], seems to resemble in some respects *Spirochaeta sinensis* found by PONS (see this *Bulletin*, 1924, Vol. 21, p. 471) in the blood of an Annamite in Saigon. The pathogenic problem of these isolated infections remains very obscure. E. H.

TROISIER (Jean) with the collaboration of J. SIFFERLEN. *Spirochaeta haemophilus*.—*Ann. Inst. Pasteur.* 1937. Mar. Vol. 58. No. 3. pp. 233-246. With 6 figs. (4 charts).

The authors, by means of blood culture, isolated a spirochaete, to which they give the name *S. haemophilus*, from the circulation of an infant who showed symptoms suggesting typhoid fever. The organism grows readily at 37°C. in a mixture of 1 part fresh blood in 4 parts of Martin's bouillon, adjusted to pH 7.4; subcultures are made every 10 days. In morphology it is clearly distinguished from leptospira, and although variable its average length is 9μ, with about 5 turns of the spiral.

Cultures were inoculated into various laboratory animals with negative results and only in man and monkeys (*Cercopithecus callitrichus*) was any pathogenic action detected. Generally after an incubation period of 4 to 8 days there was a short rise in temperature not followed by any relapse. Occasionally chronic and inapparent infections were produced which could only be recognized by blood culture.

Agglutination tests with human and monkey convalescent serum gave negative results, but the serum of two fowls inoculated with cultures agglutinated after one month in dilution of 1: 800 and 1: 1,000, falling after 3 months to 1: 200 and 1: 300 respectively. However, these birds show no sign of infection when inoculated with cultures of the spirochaete.

E. H.

DE LAVERGNE (V.) & ACCOVER (H.). La spirochétose méningée pure. Considérations épidémiologiques et pathogéniques. [**Simple Meningeal Spirochaetosis. Epidemiological and Pathogenic Considerations.**]—*Rev. d'Hyg. et de Méd. Preventive*. 1937. May. Vol. 59. No. 5. pp. 339-352. [15 refs.]

A general discussion of the problem with special reference to the increasing frequency of the meningeal form of infection with *S. (Leptospira) icterohaemorrhagiae*.

In 1935 this disease was made notifiable in France and the authors recommend that all specimens of serum sent to the Pasteur Institute for testing should be accompanied by a description of the clinical symptoms, in order to obtain further information of the various forms of this disease.

E. H.

ZIMMERMANN (E.) & UFFENORDE (H.). Ueber die Haltbarkeit der Seren gegen Weilsche Krankheit. [**The Durability of Weil's Disease Anti-Sera.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1937. May 27. Vol. 90. No. 4. pp. 319-323.

The authors tested the persistence of the immune bodies in convalescent human sera from cases of Weil's disease, and also samples of rabbit anti-sera.

The results of agglutination and lysis tests show that generally the human anti-sera lose their strength within a comparatively short time, whilst the rabbit anti-sera were still active after more than a year. No appreciable differences were noted in the keeping qualities of sera containing 0.5 per cent. phenol and those without any such preservative.

E. H.

SANDIFORD (B. R.). **A Note on *Leptospira Icterohaemorrhagiae* in Egyptian Rats.**—*Jl. Egyptian Med. Assoc.* 1936. Nov. Vol. 19. No. 11. pp. 687-688.

The author examined for leptospira the kidneys of 23 rats, all *Rattus rattus* except two *R. norvegicus*, caught in a village in Behera province, both microscopically and by subinoculation into guineapigs, with negative results. [The absence of leptospiral infection in Egyptian rats is noteworthy in view of its prevalence in many other parts of the world.]

E. H.

MASON (Neil). **Leptospiral Jaundice occurring naturally in a Guinea-Pig.**—*Lancet*. 1937. Mar. 6. pp. 564-565.

A record of a fatal case of leptospiral jaundice occurring in 1 out of 12 guineapigs which arrived at the Liverpool City Laboratories. The infection was probably derived from rats at the dealers, since 10 days previously rats had broken in and killed 2 or 3 of his guineapigs.

The occurrence of a natural infection of this nature is of interest in view of the general use of these animals for the diagnosis of Weil's disease. E. H.

SMITH (J.). **Vaccination of Guinea-Pigs and Human Beings against Leptospiiral Infections.**—*Jl. Hygiene.* 1937. Apr. Vol. 37. No. 2. pp. 261-270. [20 refs.]

The author has studied the results of vaccinating guineapigs with various strains of leptospiral infections and human beings with killed suspensions of virulent *L. icterohaemorrhagiae*.

Thirty-six guineapigs were inoculated, each with 2 doses of 1 cc. of a non-virulent culture of *L. icterohaemorrhagiae* and when subsequently inoculated with a virulent strain, all the vaccinated animals survived, whilst all the controls (18) died of leptospirosis. Complete protection was also obtained by the inoculation of cultures killed either by heat or by chemical agents (48 hours exposure to either 0.5 per cent. phenol, 0.5 per cent. formalin, or 0.5 per cent. dettol).

In addition, guineapigs were vaccinated with heterologous strains, including living and killed *L. canicola*, and living strains of *L. icterohaemorrhagiae* (Rachmat), *L. hebdomadis* and *L. biflexa* respectively. Complete protection against virulent *L. icterohaemorrhagiae* was obtained with *L. canicola*, incomplete protection with the Rachmat strain and *L. hebdomadis*, and no protection with the saprophytic strain, *L. biflexa*.

The lytic titres of vaccinated guineapigs varied from 1 : 10 to 1 : 100 in the case of those inoculated with 2 doses of non-virulent *L. icterohaemorrhagiae*, whilst those vaccinated by phenolized cultures were significantly lower, the titres ranging from 1 : 6 to 1 : 10.

The inoculation of virulent cultures following upon vaccination resulted in the development of the carrier condition, with presence of virulent spirochaetes in the kidneys of some of the guineapigs that had been vaccinated with chemically killed leptospira, and also with living non-virulent cultures of the Rachmat strain.

The vaccination of human beings gave somewhat disappointing results. Killed vaccines of both virulent and non-virulent strains were inoculated into a first series of 82 patients, each receiving a first injection of 1 cc. of a killed culture and a week later a second injection of 2 cc. In this series 33 returned for blood examination, and of these 24 gave entirely negative tests; in 7 the serum reacted to a titre of 1 : 10, and in only one case to 1 : 30. In a second series 40 patients were similarly vaccinated and of the 15 tested only 4 reacted to a titre of 1 : 10 with *L. icterohaemorrhagiae*.

A third series of 28 patients were vaccinated with a commercial leptospiral vaccine used for dogs and foxes, and again only 3 out of 13 tested reacted in a 1 : 10 dilution.

These findings indicate the necessity for increased dosage to stimulate the further production of immune bodies. E. H.

MALARIA.

BARBER (M. A.) & RICE (J. B.). *A Survey of Malaria in Egypt.*—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 413-436.

This is a survey of malaria in the Valley of the Nile, including Fayum, the Siwa Oasis in the Western Desert and in the Suez Canal Zone. The observations recorded were made between August and December, 1936. Malaria was found to be widespread in the Nile Valley. Parasite and spleen indexes were high in the vicinity of rice-fields or of large bodies of fresh water; they were commonly low elsewhere. High indexes are reported from the Siwa Oasis and the Suez Canal Zone. *Pl. falciparum* was found in the majority of places surveyed, but *Pl. vivax* predominates. *Pl. malariae* was found in the Siwa Oasis and in the Canal Zone but not in the Nile Valley. The strain or strains of *vivax* met with in Egypt are less apt to cause enlarged spleen and severe illness than the local strains of *falciparum*.

A. pharoensis, *A. multicolor* and *A. mauritianus* are common in the Nile Valley; *A. pharoensis* is an efficient vector of malaria. It has an avidity for human blood. Many specimens were found naturally infected with oöcysts, a few with sporozoites. It can be readily infected in the laboratory with both *falciparum* and *vivax*. It frequents man-inhabited tents much more frequently than houses or stables. Its distribution in the Delta agrees with the distribution of malaria. *A. multicolor*, which is also very prevalent, can be infected in the laboratory; no naturally infected specimen was taken. *A. sergenti* was found in the Siwa Oasis and in the Canal Zone. No positive evidence of its importance as a vector was forthcoming.

The authors consider that eradication of malaria would not be possible without a radical change of the system of irrigation. The prohibition of rice cultivation in the neighbourhood of large centres of population might be useful. As a palliative the distribution of *Gambusia* is recommended.

Norman White.

EGYPT, MINISTRY OF THE INTERIOR. Dept. of Public Health. Eleventh Annual Report on the Anti-Malaria Campaign in Egypt, 1934.—17 pp. With 4 maps and 3 graphs. 1936. Bulâq, Cairo: Govt. Press. [P.T. 7.]

REED (J. G.). Malaria in Relation to the Composition of Soil and Water. A Paper read at the Half-Yearly General Meeting of the Batang Padang District Planters' Association, held at Sungkai on October 28th, 1936. 7 pp.

ELSBACH (E. M.). Orienteerend malaria- en filariaonderzoek in Nieuw-Guinea. [Preliminary Survey of Malaria and Filariasis in New Guinea.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. Apr. 27. Vol. 77. No. 17. pp. 1036-1054. With 1 map & 3 figs. on 1 plate.

There was little time and opportunity for the investigator in this expedition, designed to choose a place of settlement on the lower waters of the River Digoel, to make any far-reaching research into the prevalence of malaria and filariasis among the people of the rivers of South-West New Guinea. It amounts simply to a record of figures for men, women and children at certain seasons of the year.

Interesting details are given of the character of this comparatively little known country, which are worthy of record. The rivers were the Digoel in its upper and lower reaches, its tributaries, the Mappi river and a river, the Kawarga, which joins the Digoel and the Mappi. The tribes inhabiting this region take their names from the river on which they live. They are not, however, really resident, but in a state of constant journeying from one forest clearing to another and they are also in a state of constant warfare with one another. One race is dominant among them, of fine physique and greatly feared by the rest. This race inhabits the shores of the Mappi river. They form a marked contrast to the inhabitants on the Digoel river, who are wanting in bone and muscle, have enlarged spleens and marked lumbar lordosis. Some of these differences, and also some of the lessened resistance to disease, shown by the various tribes may be related to their dietary level. Thus a marked difference exists in the type of soil of the upper Digoel and the lower Digoel. In the case of the former the soil has only a thin covering of humus, which is liable to be washed away by the heavy rain as soon as the forest has been cleared. In the case of the latter a layer of humus 30 cm. thick is present, which ensures the growth of abundance of green vegetables and even tomatoes. The Mappi Papuans, whose robust physique was specially notable, obtain abundance of fresh meat, fowls and fish. A small point illustrates very well the different outlook of this race from that of the others. The Mappians, in their bartering, do not choose such decorative articles as beads and mirrors, but prefer fish-hooks and matches.

So far as the actual field investigation went, it was found that the malaria parasitic indices at Koholombo and Wap, representing Mappians, were 6.3 and 8.4 per cent., whereas at Imahoi, a lower Digoel locality, it was 10.5. The filaria investigation at Koholombo and Wap, relating to *F. bancrofti*, gave indices of 12.9 and 9.3 per cent. In this region the vector mosquitoes are the same for both malaria and filariasis and belong to the Australasian fauna. The vector mosquitoes, which are anthropophilic, are *A. punctulatus typicus*, its variety *A. punctulatus moluccensis* and *A. barbirostris bancrofti*. Other Anopheles such as *A. bironelli*, *A. longirostris*, *A. walchii*, *A. travestitus* and *A. papuae* are of no importance as vectors.

W. F. Harvey.

SIMMONS (James Stevens). **Observations on the Importance of *Anopheles punctimacula* as a Malaria Vector in Panama, and Report of Experimental Infections in *A. neomaculipalpus*, *A. apicimacula*, and *A. eiseni*.**—*Amer. Jl. Trop. Med.* 1937. Mar. Vol. 17. No. 2. pp. 191-212. With 5 figs. (1 map). [15 refs.]

As is well known malaria control in the Panama Canal Zone, since early days, has been largely based on a policy of anopheline species control, aiming at the elimination of *A. albimanus* and *A. tarsimaculatus*, which were considered by DARLING in 1910 as the only two vectors of local importance.

A. punctimacula (*A. malefactor*) which was then, as now, very widely prevalent, has been looked upon as incapable of transmitting malaria. The hospital admission rate for malaria among Canal employees fell from 821 per thousand in 1906 to 16 in 1916, since when the rates have

fluctuated between 11 and 31. The army rates have been higher, 65.9 in 1933. The observations recorded in this paper may well explain the failure to secure any appreciable reduction of malaria incidence below the relatively low rate of 1916.

Five hundred and thirty-eight *A. punctimacula* were fed on blood containing malaria plasmodia of which 124 became infected (22 per cent.). In one group fed on blood containing 7 gametocytes of *P. vivax* per 100 leucocytes the infection rate was 56 per cent. In another group fed on blood containing from 4 to 12 *falciparum* gametocytes per 100 leucocytes the infection rate was 43 per cent. In two other groups, fed when the *falciparum* gametocyte concentration was 13 per 100 leucocytes, infection rates of 81.8 and 90.9 per cent. were noted. The author believes that *A. punctimacula* is responsible for a large part of the malaria contracted by troops in the unsanitated parts of the Zone and that as a malaria vector it may rank next in importance to *A. albimanus*. *A. punctimacula*, unlike *albimanus*, usually breeds in shaded waters.

During these experiments a specimen of *A. apimacula* was infected with *falciparum* and a specimen of *A. eiseni* with *vivax*. Thirty-one *A. neomaculipalpus* were fed on blood containing *P. vivax*: with a gametocyte count of from 4.4 to 7.8 per 100 leucocytes the infection rate was 14 per cent. When the gametocytes numbered 13.4 per 100 leucocytes the infection rate was 50 per cent. Thus of the 15 species of anophelines hitherto found in the Canal Zone no less than eight are actual or potential vectors of malaria.

N. W.

SIMITCH (Tcheda). Études sur la malaria dans la Serbie du Sud. [**Malaria in Southern Serbia**].—*Bull. Office Internat. d'Hyg. Publique*. 1937. May. Vol. 29. No. 5. pp. 919-945.

The first part of this contribution has already been noted in this *Bulletin* (1937, Vol. 34, p. 373). A large part of the present instalment is devoted to a description and justification of the methods employed in evaluating the prevalence of malaria in the different parts of the territory and its variation from year to year. The author relies on the spleen index and the parasite index of school-children, which give sufficient information if certain rules be observed, the most important being that rates, to be comparable, must be based on observations made at the same time of the year, preferably September-October, the months of maximum transmission. Few will be disposed to cavil at many of the author's contentions, which are indeed generally accepted but which are, nevertheless, justified by him at very great length. The necessity for this is not clear. Spleen and parasite indexes resulting from the examination of school-children in September-October 1935 in 262 schools in Southern Serbia are presented in tabular form and give a picture of the varying degrees of prevalence of malaria in the different districts of the territory.

N. W.

BUTTS (Donald C. A.). **Malaria in Camden County, New Jersey. Report of a Recent Outbreak**.—*Amer. J. Trop. Med.* 1937. Mar. Vol. 17. No. 2. pp. 279-287. With 5 figs.

This is a short account of an outbreak of malaria in the late summer of 1935 in Camden County, which has suffered very little from malaria in the past. Altogether 120 cases were reported.

N. W.

TISSEUIL (J.). Index paludéen chez les enfants à l'Institut Central de la Lèpre à Bamako. [**Malaria among Children in the Bamako Leper Asylum.**—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 233-234.

Among sixty-four children, aged from three months to sixteen years, in the Bamako Leper Asylum in August, the spleen rate was 70 per cent. and the parasite rate 40 per cent. All infections were *falciparum*. N. W.

CAUSEY (Ottis R.). Some Anopheline and Culicine Mosquitoes of Siam with Remarks on Malaria Control in Bangkok.—*Amer. J. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 400-420. [21 refs.]

During four years the author gathered information concerning the *Culicidae* of Siam, chiefly in the vicinity of Bangkok, but at intervals also in the interior of the country. The numerous breeding places of mosquitoes in Bangkok are described: the mosquito fauna of Bangkok is enormous, in spite of which there is very little malaria. Bodies of water open to free tidal flow are not breeding places of mosquitoes. Obstructed canals, because of their water-hyacinth, are less important as breeding places for anopheles than are the excavations and ditches. Cultivated rice-fields are responsible for breeding very few anophelines; uncultivated fields produce anophelines in abundance. The species of anopheline larvae captured, in the order of frequency, were:—*vagus*, *barbirostris*, *annularis*, *hyrcanus* var. *nigerrimus*, *tesselatus*, *aconitus* and *subpictus*. The most frequent species captured in light traps in houses were:—*hyrcanus* var. *nigerrimus*, *vagus*, *barbirostris* and *annularis*. Specimens of three species not found as larvae were captured as adults, *philippinensis*, *kochi* and *minimus*. Although *annularis* is generally considered to be a poor vector of malaria it is probably responsible for most of the little malaria transmission that there is in Bangkok.

An annotated list of culicines collected in Siam is contained in the paper.

When light traps were placed in the vicinity of breeding places, about equal numbers of males and females were captured; the further from the breeding place the greater the preponderance of females. It was also observed that mosquitoes, both male and female, are attracted by hot sweating animals in greater abundance than they are by cool animals. N. W.

SICAULT & MESSERLIN. Sur les intoxications arsenicales chez les ouvriers employés au maniement du vert de Paris. [**Arsenical Poisoning among Workmen handling Paris Green.**—*Bull. Office Internat. d'Hyg. Publique.* 1937. May. Vol. 29. No. 5. pp. 992-994. With 5 figs. on 4 plates.

Symptoms of arsenical poisoning were frequent in Morocco in 1936 among workmen handling Paris Green, which was used on a very large scale as a larvicide. Skin lesions were most in evidence. These most commonly appeared first of all on the scrotum, on the inner surface of the thighs and in folds of skin. A slightly oedematous erythema, which was extremely irritable, was the first sign; after three or four days minute papules and vesicles appeared in very large numbers.

Some days later the vesicles dried, forming blackish crusts. In some cases an ulcer formed on the scrotum, varying in size from a bean to a shilling piece, and generally with a corresponding ulcer on the inner surface of the thigh which was in contact with it. In two patients the papular vesicular eruption was generalized, being especially marked on the forehead, face, neck, scrotum and the folds of skin over the joints. General symptoms were little in evidence; a third of the patients had a coryza. Only one suffered from diarrhoea. As a preventive the application of vaseline to parts of the body most exposed and most frequently implicated has much diminished the number of cases.

N. W.

TILLI (Pietro). La disinfestione calciocianamidica. Considerazioni generali igieniche e economiche. [**Calcium Cyanamide as a Larvicide.**] *Riv. di Malarologia*. Sez. I. 1937. Vol. 16. No. 1. pp. 54-59. With 8 figs. on 2 plates & 3 text figs. French summary (7 lines).

The use of calcium cyanamide as a larvicide has previously been described by the author (see this *Bulletin*, 1935, Vol. 32, p. 817). It was used extensively in the Campagna Romana, when sanctions were being applied against Italy during the Abyssinian war, with very satisfactory results. It kills eggs, larvae and pupae of mosquitoes and is equally effective against the eggs of helminths in the water or the soil. It is useful as a fertilizer.

N. W.

MCDONALD (W. M.). **Malaria Control.** [Correspondence.]—*Brit. Med. J.* 1937. June 5. p. 1175.

This letter contains a plea for the destruction of adult mosquitoes as a valuable adjunct to anti-larval measures and a protest against its neglect. The writer considers the destruction of adult mosquitoes in houses, by swatting, fumigation and trapping, to be of great value in any campaign against malaria; it is also cheap.

N. W.

BOYD (Mark F.) & KITCHEN (S. F.). **On the Infectiousness of Patients infected with *Plasmodium vivax* and *Plasmodium falciparum*.**—*Amer. J. Trop. Med.* 1937. Mar. Vol. 17. No. 2. pp. 253-262. With 4 figs.

A number of *A. quadrimaculatus* were fed daily, or every second day, on patients naturally inoculated with *P. vivax* and *P. falciparum*, throughout the clinical attacks and for some time after. Within two hours of this feeding the number of gametocytes per cubic millimetre of peripheral blood was ascertained. Fully matured infectious gametocytes of *P. vivax* are present within five days of the first observation of parasites; they are produced, or persist, throughout the clinical attack and if the attack be longer than usual the patient remains infectious for some time after the end of the fever. Some *A. quadrimaculatus* became infected when the gametocyte density was less than ten per cubic millimeter. It appears that *vivax* gametocytes are produced at every period of multiplication, with the possible exception of the earliest divisions, until the defensive

mechanism has checked the evolution of successive parasite cycles. *P. falciparum* gametocytes are not observed till ten days after the first appearance of parasites and may not be present before the end of the primary attack. Their formation appears to be a phenomenon terminal to the completion of five or six cycles of trophozoite multiplication. No infection of *A. quadrimaculatus* was obtained with submicroscopic densities of *falciparum* gametocytes and densities less than 100 per cubic millimetre generally failed to infect. In *A. quadrimaculatus*, *vivax* gametocytes are about ten times as effective as are *falciparum* gametocytes. N. W.

BOYD (Mark F.) & KITCHEN (S. F.). **A Consideration of the Duration of the Intrinsic Incubation Period in Vivax Malaria in Relation to Certain Factors affecting the Parasites.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 437-444.

In 180 successful inoculations of *vivax* malaria out of 182, the number of days elapsing from inoculation to the first microscopical detection of parasites varied between 8 and 23, mean 13.22. The length of the incubation period did not appear to be influenced by either the length of the intrinsic incubation in the source of infection, the period of the primary attack in the source of infection at which mosquitoes were infected or the duration of the extrinsic incubation period in mosquitoes. It appeared to be influenced inversely, however, by the number of sporozoites inoculated as indicated by the number of mosquitoes used. The varying susceptibility of human hosts appears to be more important in determining the length of the incubation period than any discernible factors modifying sporozoites. N. W.

NAUCK (E. G.). Ueber Malariatodesfälle bei Seeleuten. [**Fatal Cases of Malaria in Seamen.**].—*Deut. Med. Woch.* 1937. May 14. Vol. 63. No. 20. pp. 774-775.

A German steamer put into Lagos for 4 days, during which time the crew went ashore a great deal. On the return journey to Germany about 8 to 10 persons became ill with what was finally determined to be a malarial infection and 4 of these died. The author discusses the causes which led to the late recognition of these cases with fatal results. 1. The unsatisfactory and insufficient prophylaxis. He considers that the best results would have been got by giving atebirin after leaving Lagos, in therapeutic doses, 0.1 gm. thrice daily for 5 days. 2. Overvaluation of the preventive measures as carried out by the ship's doctor or officers. The conception that quinine prophylaxis can prevent malarial infection if given *only* during the stay in the infected area is a dangerous one. Quinine is not a causal prophylactic and only delays the appearance of the symptoms, but not the infection. 3. Illness after disembarkation or during leave. The delay of the illness caused by insufficient prophylactic treatment had these unsatisfactory results, the patients treated themselves in their houses, called in the doctor late and delayed their admission to hospital for specific treatment. 4. The simultaneous occurrence of an influenza epidemic. This led to the cases being misdiagnosed. 5. "Atypical" course. MÜHLENS has repeatedly pointed out that the primary

infection with malaria is seldom typical, and it is liable to be confused with influenza, meningitis, typhoid and other infectious diseases, especially by doctors who have not had tropical experience. The spleen may not be enlarged. 6. Omission of blood examination. In illnesses of seaman, not only on board ship, but also in their houses, blood examination should invariably be undertaken. Should blood examination not be possible, every case with fever in seamen would be better treated as one of malaria in order to prevent the fatal issue. He concludes by stressing the great importance of giving ship doctors instruction in the problems of malaria on board ship.

E. D. W. Greig.

SÉNO-SASTROAMIDJOJO (R.). Nephritis bij malaria tropica. [**Nephritis in Malaria.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. Apr. 20. Vol. 77. No. 16. pp. 984-996. [32 refs.]

Acute nephritis is not a commonly observed symptom in malaria. The author describes two cases with infection of subtertian, tropical, malaria in which this was a prominent feature. There was albumen in the urine, blood and casts in the urinary deposit, and tropica rings in the blood. All these symptoms disappeared under ordinary treatment for the malarial condition.

W. F. Harvey.

YUNG Tsü (T.). Ein Fall von Malaria-Polyarthritits. [**Case of Malarial Polyarthritits.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. June. Vol. 41. No. 6. pp. 462-463.

The author describes a case of malaria accompanied with symptoms of acute rheumatic polyarthritits. Benign tertian parasites were found in the blood. With antimalarial treatment the patient was clinically cured. An editorial note at the end of the paper states that in their opinion the apparent therapeutic success and the single find of benign tertian parasites does not justify the conclusion that the malarial infection was the cause of the rheumatic attacks.

E. D. W. Greig.

MATSUNOBU (M.). Beiträge zur Hämatologie der Malariakranken. I. Mitt. Ueber die osmotische Resistenz der Erythrozyten. [**On the Osmotic Resistance of Red Corpuscles in Malaria Patients.**]—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1937. May. Vol. 36. No. 5 (386). [In Japanese pp. 992-1001. With 10 charts. [15 refs.] German summary p. 1002.]

The author has investigated the fragility of red cells in parallel with reticulocytosis in malaria patients in the febrile stages. Enumeration of reticulocytes was made by the Nile blue method. Fourteen subtertian infections were studied; on thirteen occasions in the stage of fever, on six after natural fall of temperature, and all fourteen after treatment with atabrin and plasmoquine three on the same day and eleven a week later. Six healthy subjects served as controls. It was found that usually in the fever stage the erythrocytes were more resistant to hypotonic saline than were either the controls or the

afebrile malaria patients. Occasional exceptions were observed. When the temperature became normal, whether the result of treatment or not, the resistance generally became normal, but several times considerable departures from the normal, both above and below, were seen. No parallelism was observable between the osmotic resistance and the fluctuations in the reticulocyte counts. *H. H. S.*

CORRADETTI (Augusto). Sul significato di un reperto di plasmodi con diverso grado di sviluppo nello stesso globulo rosso. [**Significance of Plasmodia at Different Stages of Development in the Same Red Cell.**—*Riv. di. Parassit.* Rome, 1937. Apr. Vol. 1. No. 2. pp. 169-171. With 4 figs. on 1 plate. English summary (4 lines).

The author records and illustrates the existence of malaria parasites at markedly different stages of development in the same red cell. For instance, a red cell containing a mature *vivax* gametocyte harboured also a merozoite. The contention that red cells are susceptible to plasmodial invasion in the reticulocyte stage only is ill-founded. This is the conclusion that the author draws from his observations. *N. W.*

VENOMS AND ANTIVENENES.

KOHLSHÜTTER (E.) & MINNING (W.). Ein Fall von Spätod nach Biss der südamerikanischen Viper *Lachesis alternatus*. [**Late Death after Bite by the South American Viper *Lachesis alternatus*.**—*Deut. Med. Woch.* 1936. Dec. 11. Vol. 62. No. 50. pp. 2043–2047.]

The poison of *Lachesis alternatus* contains haemorrhagin and thrombase but no neurotoxin. Haemorrhagin is a cytolyisin, destroyed by heating at 75°C. for 30 minutes and precipitated by alcohol. It has been proved experimentally that the haemorrhage which takes place from its action is due to lysis and rupture of the capillary endothelium and that this occurs not only at the site of the bite but also throughout the whole body. Cramps, which are an early symptom of viper bite, are the result of small haemorrhages into the brain. Thrombase is abundantly present in the *Lachesis* poison. It acts firstly upon fibrinogen to produce coagulation but also upon the fibrin proteolytically. Thus, if the concentration of thrombase is large, no coagulation at all occurs, for fibrin is immediately dissolved. The course of events after a bite is of this description: First, an extensive local thrombosis and a haemorrhagic necrosis, then a solution of the fibrin, which allows the haemorrhagin to act upon the capillaries to destroy them. As a result continuous oozing of blood, which does not clot, takes place at the bite.

Clinically, severe pain develops at the bite which may become unbearable in the course of the next few hours. This is followed by weakness, sleepiness, extremely subnormal temperature and long continued vomiting. Consciousness is never lost except in very severe cases. Vasomotor paralysis occurs on the 2nd or 3rd day and at this stage death may occur. Diffusely distributed subcutaneous and mucosal haemorrhages complete the picture. If recovery takes place it will be found that the region of the bite shows vesicles with sanguineous contents and extensive necrosis. Infection may take place and may lead to loss of fingers or toes or even of hand or foot.

The only treatment is the injection of the specific serum. No removal of any sufficient amount of poison can be effected and therefore the popular methods of sucking the wound, cauterizing it or even cutting it out are rather superfluous. Even ligature of the limb affected is to be abandoned. What is satisfactory, however, is to produce a degree of stasis by Bier's method. There is no place in the treatment of snake bite for the use of alcohol. It may stimulate for the moment, but this is quickly followed by its paralytic action which will help to promote absorption of the poison.

It has been established that the various antisera are strongly specific in respect of the various toxic elements in a poison and that there is no serum with universal action against all snake poisons. A fortunate circumstance is that an antiserum does not lose potency with age.

There follows this general description of the effects of a bite a detailed account of symptoms, treatment and post mortem findings in a particular case in which an animal keeper had been bitten and survived the bite for 8 days, which is much longer than the 3 days which, it is stated, is the limit for *Lachesis* bite. *W. F. Harvey.*

DOBREFF (Minko). Ueber die Giftschlangen in Bulgarien. Zugleich ein Beitrag ueber einen Todesfall infolge eines Giftschlangenbisses. [**Venomous Snakes in Bulgaria. A Fatal Case of Snakebite.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. May. Vol. 40. No. 5. pp. 197–200. With 4 figs.

There is a rich snake fauna in Bulgaria ; of the 28 species of snakes found in Europe 15 are met with. Four of them are poisonous : *V. ammodytes* (Sand viper) ; *V. berus* (adder, Höllennatter) ; *V. aspis* and *V. ursinii* (long-headed adder). Of these, the first is the most common and occurs all over Bulgaria ; there are three subspecies found : *V. ammodytes ammodytes* ; *V. a. meridionalis* and *V. a. montandoni*, all in the plains up to 800 metres above sea level. *V. berus* is the most venomous and lives in the mountainous districts to 2,700 metres, very rarely is it present in the plains. The black variety, *V. berus* var. *prester* is also found. The other two snakes are uncommon and resemble in many respects *V. berus*. Good photographs of the four kinds are reproduced.

Beyond the fact that cases of snakebite are far from rare in Bulgaria, nothing definite is known ; there are no statistics. The author records the case of a child of 3 years bitten on the right ankle by a (?) *V. berus*. A ligature was applied at once, but removed shortly after. Nothing else was done, and the father "waited for the train" and took the child to a chemist 4 hours after in a stuporous condition. He had no antivenene but injected round the site 1 per cent. solution of potassium permanganate ; alcohol, adrenalin, caffen and camphor were also tried, but death took place 6 hours after the bite ; the child did not regain consciousness. H. H. S.

PECK (Samuel M.), ROSENTHAL (Nathan) & ERF (Lowell A.). **The Value of the Prognostic Venom Reaction in Thrombocytopenic Purpura.**—*Jl. Amer. Med. Assoc.* 1936. May 23. Vol. 106. No. 21. pp. 1783–1791. With 2 figs.

Observation of 50 patients, 14 males and 36 females, forms the basis of this study. All were clinically typical, exhibiting a haemorrhagic tendency—purpura, ecchymoses, bleeding from mucosae—diminution of platelets, prolonged bleeding time and absence of clot retraction. Forty-four were so-called idiopathic, *i.e.*, the cause was not determined.

The prognostic reaction consists in the intradermal injection of 0.1 cc. of a 1 : 3,000 standardized moccasin venom (and a control of physiological saline) ; the result is read after an hour, though there may be a delayed reaction after 12 hours. A positive is indicated by capillary rupture and local diffusion of blood. For prognosis a series of tests must, of course, be made. A solitary test, if positive, merely indicates the existence of a purpuric state and capillary fragility ; continuance of a positive is, therefore, a bad sign, a reversal to negative is of good prognostic value. In 2 out of 8 cases the result was insistently positive ; these ended fatally. If the patient is refractory to treatment by the venom and the reaction is at the same time persistently positive, this is regarded as calling for splenectomy. Eight came within this category ; one recovered, two others improved, and in all three the venom test was reversed. In three there was no benefit ; the purpuric condition remained and the venom test persisted positive, and death occurred. H. H. S.

SERGEANT (Etienne). Action thérapeutique de l'injection sous-cutanée d'eau contre les accidents dus aux venins. [**Injection of Water in the Treatment of Venom Effects.**]—*Ann. Inst. Pasteur.* 1936. Aug. Vol. 57. No. 2. pp. 127–133. With 3 figs.

Two series of experiments are reported, the first with the venom of *Cerastes cornutus* [see also this *Bulletin*, 1936, Vol. 33, p. 400], the second with scorpion venom, *Buthus occitanus* and *Prionurus australis*.

In the first, 577 mice were injected with a dose of the viper venom which killed under ordinary conditions in two hours. The mice were divided into four groups: the first served as controls and all died; the second group of 151 received soon afterwards 10 drops of an antivenene prepared against vipers of North Africa, and 39 per cent. survived, in 56 per cent. death was delayed, the remaining 5 per cent. died in two hours, like the controls. A third group (of 101) received 10 drops of European viper antivenene; 34 per cent. survived, in 56 per cent. death was retarded, 10 per cent. died in the two hours. The fourth group (151) received injections of 10 drops of physiological saline; the corresponding percentages were 16·5 survivals, 67 death delayed, 16·5 fatal in two hours. From the figures it is seen that the European antivenene is less potent than the North African, while the saline is also protective to a degree about half that resulting from the European serum.

Experiments on the same lines were carried out with the scorpion venoms; 602 mice receiving an injection fatal in two hours in the untreated. Of these, 204 served as controls and all died within the specified time; another 398 were given 10–20 drops in either water, physiological saline, adder serum or frog serum, and 8 per cent. survived, 35·9 per cent. died in two hours, and in the remaining 56 per cent. the fatal results were delayed.

Next, the author set out to test whether the inhibiting effect was due to the water itself or to the salt content. Thirty-one mice were given 10 drops of 5 per cent. NaCl after injection of a fatal dose of the scorpion venom, 26 survived; another 34 were given distilled water in place of the saline and 30 survived (84 and 88 per cent. respectively). Hypertonic salines were less satisfactory than the 0·9 per cent.

Following up these results, the author went on to determine whether the effect was due merely to dilution of the venom before the latter had time to act upon the body cells. 678 mice were divided into six lots of 113 each: to all was given a mortal dose of *Cerastes* venom, but to group I this was mixed with two drops of the saline, to group II with four drops, to groups III, IV and V, eight, sixteen and thirty-two drops respectively, while to group VI were given, a few minutes after the injection of the venom, ten drops of the saline in a different part of the body. The results were somewhat anomalous; groups I to IV showed an average length of survival proportional to the degree of dilution of the venom, *viz.* 2½, 4, 4½, and 11½ hours, but group V, with the 32 drop dilution, survived on an average 2½ hours, or practically the same as group I, with two drops. Of this first lot 5 only survived (0·8 per cent.), whereas of group VI where the saline was injected in a different part of the body 31 survived or 27·4 per cent. and in those which died the average length of life was 13 hours. In other words, the saline was more efficacious when it was injected after the venom than when venom and saline were mixed before injection.

If, therefore, specific antivenene is not at hand, death may be delayed and perhaps averted by injection of physiological saline into a man or animal bitten by *Cerastes* or stung by a scorpion. Its use is also indicated for hyperimmunization of animals from whom the antivenenes are being prepared.

H. H. S.

GRASSET (E.) & ZOUTENDYK (A.). Recherches sur le venin et l'anavenin de la vipère du Gabon (*Bitis gabonica*). Importance de l'introduction de son antigène dans la préparation du sérum antivenimeux pour l'Afrique équatoriale. [Study of the Venom of *Bitis gabonica*; the Need for its Inclusion in preparing Antivenenes for Snakes in Equatorial Africa.]—*Bull. Soc. Path. Exot.* 1936. Feb. 12. Vol. 29. No. 2. pp. 210–217. [10 refs.]

Bitis gabonica is the largest of the African vipers, the length being from 3 to 6 feet. The venom for this study was obtained from adult specimens captured in Mozambique and kept in captivity for over a year. The venom in the dry state contains 9·6 per cent. of protein; it is readily soluble in water or physiological saline. Its toxicity was tested on mice, rats, guineapigs, rabbits, pigeons, fowls and sheep and compared with the venoms of *B. arietans*, *B. atropos* and *B. caudalis*, by intravenous or subcutaneous injection. A protocol gives details of these findings and comparisons. The important point for us at present is that the toxicity of the *B. gabonica* venom was much less than that of *B. arietans*, but was much more powerfully haemostatic. A haemophilic blood whose coagulation time *in vitro* was 25 minutes clotted with 1 in 10,000 *gabonica* venom in 5–6 minutes, whereas with the same proportion of *B. arietans* venom the blood remained uncoagulated after an hour's contact [it would appear, therefore, to retard coagulation].

The author next prepared an anavenin by addition of 0·75 per cent. formol and keeping the mixture at 37°C. After 5–6 weeks the product was practically atoxic, rabbits being unaffected by the equivalent of more than 10 m.l.d. of the original venom. Experiments at cross immunization with *B. arietans* showed that immunity due to *gabonica* anavenin is protective equally against *arietans*, whereas that due to *arietans* while highly potent against its own venom will not protect against even 2 m.l.d. of *gabonica* venom. In fact none of the antivenenes of other African vipers proved protective against *B. gabonica* venom and therefore the latter should be included in the preparation of the polyvalent product for use in Africa [see also this *Bulletin*, 1936, Vol. 33, pp. 382, 383].

H. H. S.

GRASSET (E.) & ZOUTENDYK (A.). Préparation d'un sérum antivenimeux contre le venin de la vipère du gabon (*Bitis gabonica*). [Preparation of Antivenene for *Bitis gabonica*.]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 7. pp. 609–612.

Antivenenes against the common African viperidae venoms are ineffectual against that of *Bitis gabonica*, although the reverse does not obtain, for *gabonica* antivenene is active against *B. arietans*, for example. It is essential therefore to include the former in antisera for use in equatorial Africa,

By injection of horses with the anavenin in doses from 50 to a maximum of 700 mgm. in 9 injections at weekly intervals, a serum was obtained of which 1.0 cc. neutralized 3.3 mgm. venom. By fractional precipitation concentration was obtained and 0.45 cc. of pseudoglobulin neutralized 5 mgm. of the venom. 3 cc. of the unconcentrated or 1.2 cc. of the concentrated, pseudoglobulin, serum neutralized 5 mgm. of *B. arietans* venom. Probably with more prolonged injection of the horses with larger doses a still more potent antivenene could be obtained.

By experiment an average of 200 mgm. venom can be extracted by pressure on the *B. gabonica* glands; if it be assumed that half to two-thirds of this is injected then 20–30 cc. of the antivenene should suffice in treatment of human cases.

H. H. S.

GRASSET (E.) & ZOUTENDYK (A.). **The Antigenic Characteristics and Relationship of Viperine Venoms based on the Cross Neutralizing Action of Heterologous Antivenomous Sera.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Nov. 28. Vol. 30. No. 3. pp. 347–354. [10 refs.]

The question of therapeutic cross-action is one of great importance to those preparing polyvalent antivenenes, because the Viperidae are so diverse and their venoms not well defined. The authors have experimented with the following venoms: *Vipera aspis* of Europe; *Cerastes cornutus* (North Africa); *Bitis arietans*, *B. gabonica* and *Causus rhombeatus* (South and Equatorial Africa); *V. russelli* (India), *Ancistrodon rhodostoma* (Java); *Crotalus terrificus*, *Lachesis atrox* and *L. jararaca* (Brazil), and antisera from various institutes. For South American venoms pigeons were employed, for the others rabbits, the mixture of venom and antivenene being allowed to remain at laboratory temperature for an hour before injection. The results are presented in tables, of which that correlating the details is shown on p. 724. Some difficulty arises from the fact that the sera are standardized by workers in different parts of the world who have not all the same view regarding the test dose of venom, the temperature at which the venom-antivenene mixture should be kept, the animal to be used for test, etc. The results show that antigenic relationships of viperine venoms cannot be based on zoological grounds nor on geographical distribution (see above), whereas, on the other hand, relationship is observed where both zoological grounds and geographical distribution would least lead one to expect them. It is impossible, state the authors, in the present state of our knowledge, to differentiate between "specificity" and "similarity."

H. H. S.

MALLICK (S. M. K.). **The Use of Tapioca in Immunization with Snake Venoms.**—*Indian Jl. Med. Res.* 1936. Apr. Vol. 23. No. 4. pp. 993–996.

The ordinary method, employed in past years at the Central Research Institute, for obtaining antivenene to Indian cobra and Russell's viper has been to inject horses with increasing doses of the two venoms at 10-day intervals. In most cases it was found necessary

The Cross Action exerted by the Various Antivenomous Sera Tabulated in a Comparative Form.

	Venoms						
	Europe	North Africa	Equatorial and South Africa		Asia		America
			<i>B. arietans</i>	<i>B. gabonica</i>	<i>V. russelli</i>	<i>A. rhodostoma</i>	<i>C. terrificus</i>
Serum		<i>C. cornutus</i>	<i>B. arietans</i>	<i>B. gabonica</i>	<i>V. russelli</i>	<i>A. rhodostoma</i>	<i>C. terrificus</i>
Pasteur Institute, Paris, "A.N." serum ...	<i>V. aspis</i> ++++	Specific ++++	O	O	O	+++	+
Pasteur Institute, Paris, "E.R." serum ...	Specific ++++	O	O	O+	++	+++	+
Research Institute, Kasauli, India ...	+++	++++	O+	+	Specific ++++	+++	+
South African Institute for Medical Research, Johannesburg ...	O	+++	Specific ++++	O+	O	+++	++
Instituto Vital Brazil, Anti-crotalina serum	++	O	O+	O	O	+++	Specific ++++
Instituto Vital Brazil, Anti-bothers serum	+++	++++	O+	O	O	+++	Specific ++++
Pasteur Institute, Bandung, Java ...	O	O	O	+	O	Specific ++++	+++

NOTE:—O = no demonstrable neutralizing value. O+ = feeble and ill defined cross-neutralization. +, ++, +++ = increasing degrees of definite cross action, the last being approximately equivalent to a neutralization of specific therapeutic value.

to advance to doses as high as 100 mgm. of each venom and a total of 300-400 mgm., taking about 4 months (it might be even longer) to attain the required degree of immunization. The results of adding tapioca or an absorbent aluminium hydroxide to the venoms have been studied. With tapioca the total amount of venom required was only one-third of the former quantity, though the time was not much shortened—3 months. Also, local abscesses, which were frequently seen under the old method, were much fewer. Again, under the older method, after the horse had been rested, as much as 150 mgm. of each venom might be needed to bring the antivenene up to titre, whereas with tapioca 40-50 mgm. sufficed. In the case of daboia venom, though there had not formerly been any difficulty in obtaining a high anti-venene under the old method, the use of tapioca proved very advantageous. Comparative tests were carried out with goats. The addition of tapioca gave more satisfactory results than did aluminium hydroxide.

H. H. S.

HANUT (Charles Joseph). A propos de la spécificité des sérums antivenimeux. [*The Specificity of Antivenenes.*—*C. R. Soc. Biol.* 1936. Vol. 123. No. 27. pp. 271-273.]

HOUSSAY and SORDELLI have shown that the neutralization of the coagulant action of crotaline venoms by their corresponding antivenenes is to a certain extent specific; CÉSARI and BOQUET have studied quantitatively the analogous actions of the antivenenes of *V. aspis*, *C. cornutus* and *Naja tripudians* and have found some lack of specificity in the first two in spite of their close relationship. The action of cobra antivenene, whether it reacts with these and whether the reciprocal action occurs, has not been determined.

The author has therefore investigated the coagulant or anti-coagulant actions of various venoms, and of antivenenes of aspis, cobra, cerastes and bothrops (prepared from several Brazilian Bothrops). The results are presented in the form of a table from which it is seen that the action is in general specific, the chief departure being the anticobra serum, which is more potent against the venom of *B. nummifera* than that of *N. tripudians*. The author can suggest no explanation for this at present. Other exceptions may be due either to zoological affinity or to analogy of mode of action; e.g., aspis antivenene has some effect on the coagulation due to Cerastes venom and *vice versa*. At first sight it seems strange that antibothrops serum should reduce the coagulative action of Cerastes, yet have no such action on that of *V. aspis*, but the following will account for this: In the presence of calcium Cerastes venom coagulates, just like that of Bothrops, solutions of fibrinogen, but the venom of *V. aspis* does not. Further, in contradistinction with Bothrops venom, neither that of *Cerastes* nor that of *V. aspis* coagulates re-calcified plasma. "If the anti-aspis, anti-cerastes and anti-cobra sera inhibit the coagulant effects of *B. nummifera* venom, but not that of *B. atrox*, this is doubtless due to the very marked coagulative properties of the last, which exceeds considerably that of *B. nummifera* venom."

To sum up: We may be right in stating in a general way the law of specificity of antivenenes to counteract the coagulant action of venoms, but there are important exceptions, some of which find an explanation in zoological relationship.

H. H. S.

CÉSARI (E.) & BOQUET (Paul). Recherches sur les antigènes des venins et les anticorps des sérums anti-venimeux. (Quatrième mémoire.) Action d'un sérum antivenimeux bivalent (*Bitis arietans* + *Sepedon haemachates*) sur les deux venins homologues et divers venins hétérologues. [Antigens of Venoms and the Antibodies of Antivenomous Sera. IV. Action of a Bivalent Antivenene on the Homologous and Heterologous Venoms.]—*Ann. Inst. Pasteur*. 1937. Jan. Vol. 58. No. 1. pp. 6-25.

Snake venoms may be regarded as composed of several antigenic elements and the same elements may be contained in the venoms of different species of snakes. This conception leads to the hope that by means of a mixture of venoms an antivenene might be obtained which was polyvalent. In this study, which is one of a series [see this *Bulletin* 1936, Vol. 33, p. 384], an antivenomous serum was obtained from horses immunized with the viperine venom of *Bitis arietans* (the puff-adder) and that of the colubrine snake *Sepedon haemachates* (the ringhal). In the tests the antitoxic power of the mixed serum was measured *in vivo* and the antidiastatic power *in vitro* against venoms of (1) Viperidae, *Bitis arietans*, *Vipera aspis*, *Cerastes cornutus* and *V. russelli*, (2) Crotalinae, *Crotalus terrificans* and *Bothrops atrox* and (3) Colubridae, *Sepedon haemachates*, *Naja tripudians* and *N. flava*. Each of these venoms was first investigated for its toxicity, coagulant or anticoagulant power and haemolytic power. The mixed antivenomous serum was tested for its antitoxic, anticoagulant, anti-anticoagulant and antihaemolytic properties.

Two horses, Nos. 905 and 917, were utilized for production of the antisera. They were, for upwards of a year, treated every 15 days with subcutaneous injections of a mixture of the test venoms. Thus horse 905 received, in all, 12.107 gm. *B. arietans* venom and 8.069 gm. *S. haemachates* venom. The rabbit was the test animal and the mixture of the antiserum with either a homologous or a heterologous venom was, after 30 minutes at 37°C., injected intravenously for the testing of antitoxic potency. Both of the horse antisera were found to be antitoxic not only to their homologous venoms but also, in some degree, to the heterologous venoms. Serum 905, the most active of the two against *B. arietans* venom had also a stronger potency than serum 917 against the other viperine venoms. On the other hand serum 917, which was the more antitoxic against *S. haemachates*, was also more antitoxic towards the other colubrine venoms. Curiously enough both sera were more antitoxic to the heterologous *N. flava* venom than to the homologous *S. haemachates* venom. Both antisera had little or no neutralizing action against the crotaline venoms of *C. terrificus* and *B. atrox*.

As regards the other properties investigated:—(1) The anticoagulant power of the antisera was qualitatively similar to the antitoxic power, but not completely so, in a quantitative sense. (2) The same relationship held for anti-anticoagulant action and antitoxic power. (3) A much greater divergence from parallelism, amounting to absence, was found in the relationship between antihaemolytic power and antitoxic power of the two antisera.

Thus these experiments confirm previous conclusions as to the "want of co-ordination between the antitoxic and antidiastatic properties of antivenomous sera" and "condemn definitely those methods of titration which are based on the determination of their

action on the coagulation of plasma or the haemolysis of red cells by venoms." The antigenic constituents of most of the venoms reveal serological relationships between snakes which are in no sense zoological or geographical. It would seem, too, from these experiments that the *Crotalinae* are as different from the *Viperidae* as are the *Colubridae*. It is suggested that by careful choice of venoms for mixed immunization, antisera may at least be obtained for use against all forms of snake bite in certain definite regions, say, that of a continent.

W. F. Harvey.

DEY (A. C.). **A Case of Scorpion Bite.**—*Indian Med. Gaz.* 1936. July. Vol. 71. No. 7. pp. 402–403.

It is rare for scorpion sting to be fatal and the case here reported is of additional interest because recovery seemed to have taken place when fresh symptoms set in which had a fatal issue within 24 hours of the infliction of the sting.

The patient was a girl of 11 years, stung on the left breast and on the chin. An hour later she was restless and perspiring, complained of burning pain at the sites stung, and was frothing at the mouth. On being brought to hospital she was in a state of shock, temperature 96°F., pulse 145, heart sounds feeble, pupils dilated, eyes congested, tongue dry. The same evening there was much improvement and the child passed a fairly good night, and seemed well in the morning, but later became restless, vomited some blood about 10 a.m. and passed a stool containing blood; respiration rate increased to 45, and the pulse to 160 per minute and death occurred in a little over an hour. Colonel CHOPRA adds a note on scorpion poisoning and on the venom.

H. H. S.

SERGEANT (Etienne). **Piqures de scorpion en Algérie (1934).** [**Scorpion Sting in Algeria.**]—*Arch. Inst. Pasteur d'Algérie.* 1936. Mar. Vol. 14. No. 1. pp. 53–61. With 1 fig.

This article is in itself very condensed and hardly permits of abstract. Scorpion stings vary greatly in the severity of the symptoms they provoke in different parts of Algeria; in some districts (7 are mentioned by name) they have caused death, not only in children but in adults also, whereas in others the results are comparatively mild. Fatal cases are recorded every summer in Tiout (Oran Departement), Ain Boucif, Bou Saâda and Mzab (Algiers), and Biskra, Touggourt and Ouargla (Constantine); in 9 other places fatalities are occasionally recorded. A list is given of 51 areas where stinging is reported, but no fatal cases, and another of 39 areas whence no cases have been reported. The species met with are: *Heterometrus maurus*, which is very common but does not cause serious symptoms; *Buthus occitanus*, also very common and exceptionally causes death in children; *Prionurus aeneas* and *P. liouvillei* are two black varieties, but no fatal results have been recorded from their poison, in spite of the widespread belief that it is the black scorpions which cause death; *P. australis* has a potent toxin, some 20 times that of *B. occitanus*, and is accredited with several deaths each year, in fact it is this species which is responsible for most of the fatalities.

H. H. S.

SERGEANT (Eteinne). Obtention d'un sérum actif contre le venin de scorpion. [Preparation of Scorpion Antivenene].—*C. R. Acad. Sci.* 1936. Mar. 16. Vol. 202. No. 11. pp. 989-990.

—. Préparation d'un sérum contre le venin de scorpion.—*Ann. Inst. Pasteur.* 1936. Sept. Vol. 57. No. 3. pp. 240-243.

In Algeria deaths from the sting of the scorpion, *Prionurus australis*, are not uncommon. The author therefore set about preparing an antiserum from the ass, this being a very susceptible animal. Preliminary investigations determined that the lethal dose for mice was one-fortieth of a telson (terminal segment of the scorpion). The telson was used because it was found practically impossible to obtain the poison in ponderable amount. The amount in individual telsons varied, so a large number were pooled and the venom for injection prepared thus :

The telsons, removed during life, are kept at 37°C. till dry, then in the dark in sealed tubes at 15-22°C. One hundred and two were ground in a mortar with 2 cc. of 0.9 per cent. physiological saline, and the resultant mass diluted with 64 cc. saline. After centrifugation, the opalescent fluid is decanted into a sterile flask, 34 cc. of neutral sterilized glycerin added and the mixture kept at 37°C. for 15 days ; it is then ready for injection. The fatal dose for a mouse is half a drop in 5 drops of saline.

As little as one-tenth of a telson may kill an ass, so the immunization has to proceed very cautiously. Starting with one drop (= 1/20 telson or 2 mouse m.l.d.) injected subcutaneously the dose is gradually increased at 3-4 day intervals, ceasing for a time if there is rise of temperature or loss of weight. After 7 or 8 injections, *i.e.*, having reached about 20 drops, the venom is more highly diluted for injection, and after the higher injections, equivalent to 5 telsons, intervals of 2-3 weeks are allowed to elapse and the animal is bled. In 12 months a serum of considerable potency was obtained. Of 208 mice receiving a fatal dose and 10 drops of the antivenene 173 survived (83 per cent.), whereas 76 controls all died. In another series 17 survived out of 18 receiving 3 m.l.d. and 10 drops of the serum. It was found equally efficacious against other scorpion venoms ; nine out of ten survived after injection with the poison of the yellow scorpion (*Buthus occitanus*) and the black scorpion (*Pr. lionvillei*). For man the dose suggested is 20 cc. at least.

H. H. S.

D'AMOUR (Fred E.), BECKER (Frances E.) & VAN RIPER (Walker).

The Black Widow Spider.—*Quarterly Rev. Biol.* 1936. June. Vol. 11. No. 2. pp. 123-160. With 7 figs. [13 refs.]

Latrodectus mactans, the Black Widow, Hourglass, or Shoebutton spider, is found throughout almost all the United States, parts of Canada, Central and South America as far as Peru, and the West Indies. The authors believe that they have good evidence that it is increasing greatly in numbers in the United States ; at times it is so numerous that the grape-pickers in Colorado refuse to work in the vineyards. According to Emil Bogen, five per cent. of the spider bites cause fatal results in man. He has described the symptoms as they occur in human beings (*Ann. Intern. Med.*, 1932). The bite is not painful, but it is followed by a dull numbing pain, which ascends from the extremity bitten, and then becomes localized in the muscles of the chest, back and abdomen ; this pain is very severe. The abdominal wall becomes rigid, and respiration is impeded by spasms of the

thoracic muscles. The blood pressure rises, and there is often nausea and vomiting; there is also slight fever and leucocytosis. These symptoms appear within four hours, and may last for two or three days. In fatal cases death occurs in 18-36 hours. [See also this *Bulletin*, 1936, Vol. 33, p. 401.]

The Black Widow is a small spider; the length of the female, which is about four times the size of the male, is 1 to 1.5 cm. The pair of poison glands lie superficially under and behind the ocular region of the cephalothorax. Each gland is 1-2.5 mm. in length, and weighs 1.5-2 mgm. The life cycle of the female appears to last a little more than a year; that of the male is shorter.

The female produces from 1-4 egg sacs, each containing on an average 140 eggs.

The authors obtained the venom by macerating the poison glands in salt solution; young rats, 50-60 gm. in weight, were used in the experiments. The amount of dried venom obtained from each spider was, on an average, 0.126 mgm. The "average lethal dose," that is the amount of venom which will kill fifty per cent. of rats, is one-fourth of the venom yielded by one spider. The injections into the rats were all given intraperitoneally; the spiders used were all mature females, as indicated by the absence of any markings on the dorsal surface.

A few experiments were made to determine the toxicity of immature females and male spiders; the venom of six immature females caused symptoms in the rats, which however all recovered, the venom of twelve males caused practically no symptoms.

When a spider bites another of the same species, the latter is immediately paralysed, but may recover after several hours.

The venom of the mature female is extremely potent; the authors found that 1 mgm. of rattlesnake venom (*Crotalus albicans*) was required to kill ninety per cent. of the rats; the same result was caused by only 0.064 mgm. of *Latrodectus* venom. The eggs of the spider are also highly toxic; they contain some poisonous material which is also found in the tissue fluids of the spider. It was found that 1000 eggs weigh 640 mgm. and yield, on maceration in distilled water, filtering and drying, 100 mgm. of a pale yellow, flaky precipitate. The dried venom of the glands, and the dried precipitate from the eggs showed little, if any, diminution in toxicity after being kept for seven weeks. The toxic material in the eggs is neither a lipoid nor an alkaloid, but is probably a globulin, or associated with globulins.

The venom in the poison glands is highly labile; the glands, macerated in distilled water, yield a filtrate which gives positive reactions for protein. When subjected to dialysis, the concentrated dialysate caused no symptoms; while the equivalent of half a spider of the non-dialysable residue killed 87 per cent. of the rats. Though various precipitating agents were tried, it was not found possible to separate the protein from any other non-dialysable substance.

S. C. LIU and H. WU reported (*Chinese Journ. of Physiology*, Vol. 8, 1934) that methyl alcohol can precipitate proteins without causing denaturization if the length of time does not exceed four hours. The venom glands of 40 spiders were macerated in 10 cc. of distilled water. One cc. of this was used as a control; 4 cc. of the remainder were treated with 100 cc. of absolute methyl alcohol, and left in the refrigerator for three hours. A white precipitate was formed, quickly and dissolved in saline. Another 4 cc. of the venom solution

was treated in the same way, but only left standing for one hour. The filtrate from these solutions was evaporated to a small volume. In the rats which received the protein precipitate paralysis of the legs set in early, and was as severe as in animals receiving ordinary venom. But the animals showed no general depression, no respiratory symptoms, no affection of the lachrymal glands, and no sanguineous discharge from the nostrils, such as occur when ordinary spider venom is administered: recovery from the paralysis occurred within a few hours. It seems likely that there are two factors present in the venom, one of which, the more lethal, is destroyed by alcohol, while the other factor is not affected.

When the venom is given by the mouth, no symptoms of poisoning follow. Both pepsin and pancreatin were found to destroy the toxicity of the venom; so, too, do weak acids and bases. Boiling for five minutes, and exposure to 75°C. for 20 minutes, completely destroyed the toxicity, but it was not affected by exposure to 37°C. for six hours.

An attempt was made to immunize 26 rats, of which 10 were mature and 16 immature. The full-grown rats were given a quarter of the venom of a spider twice a week for three weeks, then half twice a week for two weeks; the young rats received smaller quantities of venom spread over the same period of time. Then all the animals were given an injection of one spider's venom. Of the adult rats, all showed symptoms of poisoning, but recovered; of the 16 immature rats all showed symptoms, and 6 died. Thus it seems that little, if any, immunization had occurred.

The survivors were injected for a further period of five weeks, and were then given the equivalent of one spider each: no symptoms followed. Three days later they were given two spiders each, and again, three days later, four spiders each; no symptoms whatever followed. It appears therefore that the rats had acquired tolerance, or had become immune. It is evident that immunity develops very slowly; five weeks of injections gave little protection, and it was only after nearly three months treatment that a high degree of immunity was obtained.

These immune rats were bled, and various mixtures of serum and venom were made. It was found that $\frac{1}{2}$ cc. of the serum added to the venom of 10 spiders completely protected all the rats, which showed no symptoms of poisoning. In other rats, the venom of two spiders was injected, followed after 10 minutes by $\frac{1}{2}$ cc. of serum; no symptoms of poisoning occurred. In other cases 1 cc. of serum caused prompt recovery when given one hour after the venom injection, when symptoms of poisoning were well advanced. When the venom was given subcutaneously, 1 cc. of immune serum, injected intraperitoneally after 3 $\frac{1}{2}$ hours, was followed by recovery.

There is also some evidence of transmission of antibodies through the placenta, but the immunity is not very marked. It was also found possible to immunize rats against the poison contained in spiders' eggs, and the serum was protective against egg-poison. Experiments showed that spider venom and the poison of the eggs are distinct; neutralization of egg-poison by venom-immunized serum does not occur, nor does the reverse.

A commercial firm was able to immunize sheep against spider venom; the sheep yielded a serum of some potency, $\frac{1}{4}$ cc. of which

protected rats against the equivalent of two spiders, when given intraperitoneally.

Autopsy of rats killed by spider venom showed no gross pathological lesions, nor any decided histological changes in the organs of the body.

H. J. Walton.

HARGIS (A. S.). **Arachnidism.**—*New England Jl. of Med.* 1936. Sept. 10. Vol. 215. No. 11. pp. 489–492. [12 refs.]

A review of the subject of poisoning by the Black Widow spider, *Latrodectus mactans*. The bites are becoming more common, at all events more cases are being recorded. The symptoms may simulate those of "acute abdomen." During the past 15 years 43 patients have been admitted to hospital; admissions have occurred at all seasons, but more in late summer and early autumn. Little is known as yet concerning the poison, but it probably acts on the myoneural terminations. None of the 43 cases studied by the author terminated fatally. [See this *Bulletin*, 1936, Vol. 33, p. 401.] H. H. S.

D'AMOUR (Fred E.). **A Comparative Assay of Black Widow Anti-Sera.**—*Proc. Soc. Experim. Biol. & Med.* 1936. Nov. Vol. 35. No. 2. pp. 262–263.

The author has made assays of human serum from a convalescent from Black Widow spider bite and of immune serum prepared from sheep. His method was to dissect out the venom glands and macerate them in saline, and the average lethal dose for rats was determined, *i.e.*, the amount which caused the death of half the animals tested. Varying amounts of the sera were added to emulsions of the venom, and injected after being in the refrigerator over night. The results are presented in a table and show that the sheep antivenene has a much greater potency; 1 cc. was found to neutralize completely 25 average lethal doses, whereas 1 cc. of the human serum did not neutralize even 2 doses of the venom. [See also this *Bulletin*, 1935, Vol. 32, p. 914, 915; 1936, Vol. 33, p. 401.] H. H. S.

LE GAC (P.). Accidents consécutifs à la piqure d'une araignée venimeuse, le *Latrodectus menavodi*. [**Bite by a Venomous Spider, *Latrodectus menavodi*.**—*Bull. Soc. Path. Exot.* 1936. May 13. Vol. 29. No. 5. pp. 621–622.]

A soldier, 23 years of age, was resting on the ground during manoeuvres when he was bitten on the right thigh by a spider. The pain was very severe, of a burning character, and the limb began to feel numb; this numbness soon spread to the left leg also and he could not move his legs. In half an hour the pain extended upwards over the abdomen; violent headache supervened and the arms were benumbed. That evening on arrival in hospital all the limbs seemed paralysed and the patient unconscious; the features were drawn, limbs cold, reflexes lost; the pulse small, uncountable and the body bathed in sweat. Next day the patient still complained of headache, but the paresis had disappeared and he could walk without difficulty, but reflexes were still in abeyance for some hours; pulse 75 per minute.

The following day he left hospital quite recovered. No antivenene was obtainable and the treatment usually followed is intravenous injection of sulphate of magnesium, 25 per cent. solution, and this is found quite successful (the quantity is not stated).

Three species of *Latrodectus* are found in Madagascar, *L. mactans* or "black widow," *L. hasseltii* or "red-backed spider" and *L. menavodi*. According to ASIS the venom has a predilection for the peripheral nerves and their endings, and affects the central nervous system hardly at all.

H. H. S.

FINLAYSON (M. H.). **Specific Antivenene in the Treatment of "Knopple-Spider" Bite.**—*South African Med. Jl.* 1937. Mar. 13. Vol. 11. No. 5. pp. 163-167.

The author has described the preparation of *Latrodectus indistinctus* antivenene and shown that it will also neutralize the venom of *L. concinnus*. In the present article he demonstrates that the venom of *L. indistinctus* is precipitated by *L. concinnus* serum at the same titre as the homologous serum and therefore they probably possess the same antigens. The reverse does not hold good. *L. concinnus* venom is not precipitated so strongly by *L. indistinctus* serum as by the homologous antiserum, i.e., *L. indistinctus* venom possesses an additional antigen. Further experiments showed the activities of *L. indistinctus* antivenene prepared from goats in the treatment of guineapigs inoculated with the venom.

The author goes on to record brief notes of eighteen human patients bitten by the knopple spider, who received this antivenene, usually in a dose of 5 cc. subcutaneously, but in others 10 cc., or 2.5 cc. plus the same intravenously. Although some were in a state of collapse when the serum was administered, all had practically recovered within 24 hours of receiving it. Though knopple spider bite is not often fatal, the value of the antivenene has been clearly shown. A large supply is kept for issue at the Biological Control Laboratories, Union Health Department, Cape Town.

H. H. S.

FINLAYSON (M. H.). **"Knopple-Spider" Antivenene.**—*South African Med. Jl.* 1936. Nov. 14. Vol. 10. No. 21. pp. 735-736.

In the Cape Province "knopple spider-bites" are caused by two species of *Latrodectus*, *L. indistinctus* and *L. concinnus*, but the venom of either is neutralized by antivenene of the former, which abounds in the sand-veldt areas of the Province.

The author has prepared an antivenene in the following manner:

Heads of the female *L. indistinctus* were extracted at 0°C. with sterile distilled water, and the extracts centrifuged and dried over P_2O_5 at 0°C. three times. The final powder was used as the venom; it had no haemolytic action on guineapigs' corpuscles.

Goats were inoculated with an initial dose of 5 mgm. of venom and sufficient rabbit antiserum almost to neutralize it. At four-day intervals injections were given of the same amount of venom but decreasing antiserum, and later venom alone in increasing doses. After 3 months the dose reached was 50 mgm. subcutaneously. By 2½ months 0.05 cc. of serum neutralized 1.0 mgm. venom, which was the highest titre

obtained. Mice were used as test animals. 0.2 cc. of a 1 in 5 dilution of antivenene injected 18 hours after 0.3 mgm. of the venom resulted in recovery. 1.0 cc. of the serum will protect mice against 7.5 mgm. of venom or 150 mouse lethal doses.

When, in place of injections of artificially prepared venom, mice were subjected to bites of the spider 0.2 cc. of the antivenene injected subcutaneously 30 minutes after the bite was followed by recovery; a control mouse and another given 0.1 cc. died within 24 hours. Individual *L. indistinctus* may possess 200 mouse m.l.d. of venom, needing about 1.3 cc. of antivenene. The serum has been put up in ampoules containing 5 cc. which should afford ample protection against accidental bites from this spider. It will be issued free to district surgeons and practitioners in areas where these accidents occur.

H. H. S.

CHEVERTON (R. L.). **Irritation caused by Contact with the Processionary Caterpillar (Larva of *Thaumetopoea wilkinsoni* Tams) and its Nest.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1936. Feb. 29. Vol. 29. No. 5. pp. 555–557. With 4 figs. on 1 plate.

The moth whose larvae and nests produce the symptoms detailed below is found in Europe, Africa, Madagascar and Cyprus. Contact with the caterpillar or with dust from its nest produces symptoms of severe irritation. The case here recorded is that of a boy who disturbed a nest and by the following day there was marked conjunctivitis, oedema of the face and particularly the eyelids, succeeded in a few days by local superficial gangrene of the lids of the right eye. Three weeks later the gangrenous area had separated leaving a scar, and there was a residual corneal ulcer and conjunctivitis.

The author gives an account of the life history of this moth. Eggs are laid in October; pupation takes place during March at sea level, a little earlier at higher altitudes up to 4,500 feet. In Cyprus, the nest is from 4–12 inches long, and cone-shaped, white and glistening at first, later brown. When the nest is disturbed or the caterpillar handled, large urticarial wheals appear very rapidly, accompanied by intense irritation. For this reason, entomologists use rubber gloves when handling them. More work is needed to determine the toxic substance, its source and nature. Some think it is the excreta, others the special hairs or spines with poison cells. "These hairs are hollow and contain the poison, each hair having a gland cell opening into the seta, which contains the poisonous secretion; the fine barbed hairs penetrate the surface causing the poison to spread. The secretion inside the seta retains its urticating properties for a long time . . ." If the hairs be washed with ether, the extract causes urticaria but the residual hairs no longer have this action. The article has a good illustration of the caterpillar, the nest, the hairs and the patient.

H. H. S.

ESCOMEL (E.). **Envenimation neuro-myopathique par la morsure d'une scolopendre. [Poisoning by Centipede.]**—*Bull. Soc. Path. Exot.* 1936. Mar. 11. Vol. 29. No. 3. pp. 282–284.

A man was sitting on the trunk of a tree which he had felled and was bitten on the left leg by one of a number of centipedes (*Scolopendra*)

he had disturbed. In a few moments the place began to itch, then felt tense, and soon after became painful. The leg and foot swelled rapidly and became a dark red, in the middle of the inflamed area the bite was visible. He applied cold compresses and in four days the swelling was diminishing, as were also the other local symptoms, and in a month there was no trace of oedema and merely a little staining of the skin. So much for the local condition. Ten days after the bite he experienced severe headache, of sudden onset, followed by general depression, lassitude and muscular weakness and lay listless in bed. He had till then been a strong and active man. He was slow in cerebration, his memory was bad, there was some inco-ordination and obstinate insomnia for several days. From time to time he had attacks of shivering; speech was slow and laboured. Four weeks after the bite he consulted the author; he walked supported by a friend's arm; his gaze was vague and somewhat fixed; he got up from a chair with difficulty (not due to pain but to "want of energy"); tendon reflexes present, but diminished. Pulse 60, regular but feeble, muscle-power by dynamometer 75 in right hand, 70 in left; (formerly it had been 100 and 95 respectively). The condition is aptly described as one of neuromyopathy. Treatment was symptomatic.

H. H. S.

BARROS (Evandro da Fonseca). Hyper-sensibilidade ao veneno de marimbondos. [Susceptibility to Wasp-Sting.]—*Brasil-Médico*. 1937. Feb. 20. Vol. 51. No. 8. pp. 297-301. English summary.

Polistes canadensis is a domestic wasp of Campos and S. João da Barra, in the State of Rio. It is astonishing that wasp-stings are not more common, for nearly every house has a colony or two attached to the roof or other part where they are not likely to be disturbed. It is, it seems, usually a pacifist, and flies about its business harming no one unless interfered with or its nest is repeatedly attacked. People carry out their usual occupations unmolested and if the wasp settles on them, it does no harm if no attempt is made to drive it away. If, however, they are repeatedly irritated, they become very vicious and will follow the marauder for a considerable distance, especially in nesting time.

Details of seven cases are recorded here. The effects of the sting are: irritant action on the tissues with swelling, oedema, urticaria, and symptoms of constitutional disturbance, such as dyspnoea, sweating, vomiting, anxiety, fall of temperature, and in severe cases more shock, loss of consciousness and even death has been reported. The venom has not yet been studied.

H. H. S.

KELLAWAY (C. H.) & LEMESSURIER (D. H.). The Venom of the *Platypus* (*Ornithorhynchus anatinus*).—*Australian Jl. Experim. Biol. & Med. Sci.* 1935. Dec. 16. Vol. 13. Pt. 4. pp. 205-221. With 12 figs.

On the inside of each hind limb near the ankle the male platypus has a sharp spur which is canalized and conveys the secretion of a crural gland and a wound by this spur results in severe pain, local swelling and symptoms of shock. The author carried out experiments

on cats, rabbits and guineapigs with an old sample of venom and a little obtained from a platypus soon after death. The old sample had but slight coagulant action ; the coagulation time of shed blood in normal animals was prolonged ; this was shown also in citrated plasma *in vitro*. Intravenous injection of the venom is followed at once by marked fall in blood pressure, without intravascular clotting ; it is due to vasodilatation and is peripheral in origin (compare the Australian snake venoms) ; there is no evidence that the carotid sinuses or vagi play any part. The venom has no specific action on the central nervous system, nor any curari-like action peripherally. In brief, platypus venom has a weak coagulant, haemolytic and cytolytic property, but no specific neurotoxic action and the fall of blood pressure is due to peripheral not central action, to vasodilatation.

H. H. S.

REVIEWS AND NOTICES.

STEPHENS (J. W. W.) [M.D., F.R.S., Professor Emeritus of Tropical Medicine, University of Liverpool]. **Blackwater Fever. A Historical Survey and Summary of Observations made over a Century.** With Foreword by Col. Sir S. Rickard CHRISTOPHERS, C.I.E., O.B.E., F.R.S., I.M.S. (ret.).—pp. xvi + 728. With 1 plate. 1937. Liverpool: University Press; London: Hodder & Stoughton Ltd. [15s.]

Those who purchase this book under the impression that they are acquiring a work which deals with its subject in the traditional manner will be sadly disillusioned. It is something which in the reviewer's experience is unique. The first impression is so overwhelming that the reader must perforce soon close the volume in order that he may regain his shocked and scattered wits. After a rest—short or long according to the effect of the first impact—he will return to the attack more cautiously, and timidly examine the preface to find out what it is all about. There he will read:—

I have attempted in the following pages to give an account of blackwater fever since its first recognition as a distinct condition about a century ago.

The extracts given are necessarily brief, and though separated from their context will, I think, suffice to illustrate the development and present state of our knowledge, imperfect though it be, of the various aspects of the blackwater fever problem.

The material has been arranged for the most part in alphabetical order, and the various data in chronological sequence.

These data appear to be of very unequal value, but I have not considered it necessary to express my own opinion of the various records, for their contradictory nature is in itself sufficient to show that they should be very cautiously examined before being accepted as fact.

In this book Stephens has accomplished, as probably he alone could, the gigantic task of gathering together the conflicting mass of statements which has appeared in the literature of this disease from the earliest times. Chapter I, consisting of 6 pages, is devoted to the synonymy, and even the long list of synonyms mentioned here is only a selection from the more complete list given in Appendix I. It is interesting to note that the name blackwater fever was first used by EASMON in 1834. Chapter 2 deals with the geographical distribution, and Chapter 3 with the history of disease going back to the time of Hippocrates (406–370 B.C.). The "Epidemics" contain 42 case-histories and 15 of these cases had black urines and 3 red. These case-histories are summarized in Appendix 2. Disregarding 5 cases in women (4 in child birth and so possibly "puerperal") 13 remained; and in a table Stephens has given an analysis of the symptoms of these 13, which we should expect to find in blackwater fever. The modern history of blackwater fever in Greece begins in 1858.

Chapters 4 to 7 are concerned with aetiology; the first records the general factors which have by various writers been supposed to bear on the matter, the second the reasons for considering malaria as an aetiological factor, and the third and fourth observations on which depends the belief that quinine, cinchona, cinchonine and plasmoquine provoke attacks of blackwater fever.

Chapter 8, consisting of 165 pages, deals with the symptomatology of the disease. Here, as in many parts of the book, the material is

arranged alphabetically, so that the first symptom referred to is "Ascites" and the last is "vomiting."

The remaining four chapters deal with treatment, prognosis and prophylaxis, with changes in the blood, with changes in the urine and faeces, and with the pathology of the disease.

The volume does not, however, close at this point. There follows a series of 25 appendices, which occupy no less than 120 pages. In these appendices the author has collected from the literature the observations bearing on such matters as malaria parasites in blackwater fever, the intervals between quinine and haemoglobinuria, and the day of death. He discusses the history of the discovery of Peruvian bark, its introduction into Europe and the controversies relating to its use in England, France, and elsewhere; the discovery and use of quinine and its toxic effects; and many other matters. The appendices are followed by Addenda and by an enormous list of references.

One of the facts which will most strongly impress anyone who knows the author is the almost complete absence from this book of anything in the way of criticism. The explanation is, however, to be found in the last paragraph of the preface which reads as follows:—

It will, I think, be evident from this compendium that a complete and accurate epitome of blackwater fever could not be written until the conflicting mass of statements in the literature are harmonized by more precise observation, by the use of modern methods of investigation, and by a much more rigorous use of the critical faculty than has hitherto obtained.

From this it would appear that in Stephens' view criticism in the present state of ignorance could serve no useful purpose. Still it is refreshing to read here and there at the close of a chapter a few lines like the following, which appear at the end of the 57 pages describing the various forms of treatment which have been recommended:—

The treatments here summarized have been advocated with no more evidence of their efficacy than that the patients (or some of them) survived. In some cases only a single case has been treated! The fact that many cases recover without the use of any special drug or drugs—a fact over and over again ignored—invalidates the claims made.

Of the multitude of treatments used, perhaps saline has the best record, though it should be used cautiously. The evidence as to whether Q. should be given or not is conflicting. It would seem to be unnecessary unless there is evidence to the contrary.

Of modern treatments, transfusion in cases of grave anaemia would appear to be beneficial.

Any reviewer who wrote of this book that it should be on the shelves of every medical man practising in the tropics would quickly be discredited. But this statement is not to be taken as implying that the present reviewer considers the work to be of little value. Far from it; the book is of immense value, but to a more limited clientèle. To the reviewer's mind, Sir Rickard Christophers sums up the matter when he writes in the Foreword:—

With the present volume in his hand, two thoughts will probably be uppermost in the reader's mind, first, what a mass of facts of a sort have been accumulated, e.g. in the symptomatology so fully set out by the author, and secondly, what a need there is of a really adequate investigation of this disease on modern lines. If Professor Stephens' book has done nothing else, it has given a sort of platform of so far recorded data from which both the medical man and the pure investigator can start square, the first with a means of easily ascertaining what clinical and pathological

observations have been made and what treatments described, and the latter with the jungle of past literature mapped, abstracted and systematised.

W. Yorke.

MISHNAEVSKY (M. N.) [Edited by]. [**The Malarial Mosquito and the Measures for combating it.**—Publ. by the Azov-Black Sea Regional Tropical Institute and the North-Caucasian Regional Institute of Epidemiology and Microbiology. 1937. Rostov-on-Don. 224 pp. With 64 figs. [In Russian.]

This is a practical guide intended for medical officers and others engaged in anti-mosquito measures of prophylaxis of malaria in the South Eastern parts of U.S.S.R. The various aspects of the work are dealt with in four sections. In the first, by I. G. Ioff ("Mosquitoes as malaria vectors and the fight against them"), the morphology and systematics of mosquitoes are briefly disposed of in three keys: one for the determination of the genera of Culicidae, another for the identification of the larvae, and the third for determining the important species of *Anopheles*. The main part of this section is devoted to the biology and ecology of mosquitoes, especially of *A. maculipennis*; to their role in the transmission of malaria, and to the methods used for their destruction and for protection against them. In the second section ("On the organization of antimalarial hydrotechnical works") the same author describes various types of water collections in which anophelines breed and deals with the antimalarial methods applicable in each case. The third contribution ("Amelioration works in the antimalarial campaign"), by A. A. Dotsenko, is devoted entirely to the hydrotechnical aspect of antimalarial measures: a description is given of methods of surveying water collections, of draining swamps, and of regulating the course of rivers and canals, etc. Finally, V. A. Nabokov ("The aviochemical method of combating the larvae of the malarial mosquito"), describes the methods of distributing larvicidal substances from aeroplanes.

C. A. Hoare.

SICÉ (A.) [Médecin du Corps de Santé Colonial Ancien, Directeur de l'Institut Pasteur de l'A.E.F.]. **La trypanosomiase humaine en Afrique Intertropicale.** Préface de M. le Professeur Mesnil.—pp. xi + 306. With 43 figs. (including 1 map) & 4 plates (2 coloured). [569 refs.] 1937. Paris (VIe): Vigot Frères, Editeurs, 23 rue de l'Ecole-de-Médecine. [50 fr.]

This volume is written by one who has spent many years in the field carefully studying the disease, and who has made many valuable contributions to knowledge of it.

It is divided into 5 chapters, the first of which, apart from a few pages devoted to historical matters, is entirely concerned with the geographical distribution of the disease in different parts of tropical Africa. The second chapter deals with epidemiology; here the author gives an account of the trypanosomes and tsetse flies, and discusses certain factors bearing upon the epidemiology of the disease.

Chapter 3, which is concerned mainly with symptomatology and pathology, is particularly valuable. To anyone familiar with the author's work it is not surprising to find the changes in the cerebro-spinal fluid, and their significance for prognosis and treatment, discussed in great detail. The description of the pathology of the disease is good, and the chapter ends with a consideration of the

various methods of diagnosis. The next chapter is devoted to treatment, and the last to the subject of prophylaxis.

At the end of the volume is a list of 569 references; unfortunately, however, a surprisingly large proportion of the reference numbers given in the text do not relate to the appropriate references. Thus on page 205 we see Zupitza (560), but on turning to reference 560 we see that it relates to a paper by Yorke, Murgatroyd & Hawking; similarly, on page 168 we read Peruzzi (469), whereas the correct reference should be 473. This sort of mistake is very frequent and may prove rather irritating to those who are not very familiar with the literature of the subject.

In the reviewer's opinion, Sicé's book is the best and most comprehensive account of African trypanosomiasis in existence. It is a worthy successor of Laveran et Mesnil's classical work "Trypanosomes et Trypanosomiasis," and cannot fail to prove of the highest value to all engaged in an attempt to combat this great scourge of tropical Africa.

W. Yorke.

LAPAGE (Geoffrey) [M.A., M.D., Institute of Animal Pathology, University of Cambridge]. **Nematodes Parasitic in Animals.**—pp. x + 172. Methuen's Monographs on Biological Subjects. 1937. London: Methuen & Co., Ltd. 36 Essex Street, W.C. [4s. 6d.]

The object of the publishers in providing the general reader with a brief authoritative account of present knowledge in some specialized branches of the biological sciences has been achieved in an admirable way by Dr. Lapage in this little book on *Nematodes Parasitic in Animals*.

Its scope may be judged from the titles of the four chapters into which the subject matter is divided (1) Structure, life-histories and classification. (2) Physiology. (3) Resistance of host to nematode infestations and (4) The control of nematode infestations.

The method of treatment may be described as "zoology with a medical bias" and is an account of the modern helminthologist's knowledge rather than of the progress of specialized academic zoology. Nevertheless, the author goes into considerable detail over the physiology of these parasites and if one were to offer any criticisms at all it would be to suggest that a too generous proportion of the space had been given to this branch of the subject and a too meagre one to the account of life histories, structure and classification. But the author holds strongly to the view that a better understanding of the physiology of these parasites is the key to the progress of our knowledge at the present time, and there are certainly grounds for that view.

One error has crept in on page 21 where *Dictyocaulus filaria* is represented as requiring the intervention of an invertebrate host for the completion of its life history, the name "Schwartz" is misspelt in several places, and one slight error was noticed in the list of references (seen in a comparison of Nos. 5A and 277) but proof reading on the whole has been well and carefully done.

The text is a clear, concise and uncritical account of the work which has been done on parasitic nematodes, and this, together with the very numerous references to the 404 original publications which are given in the bibliography, renders the book a most readable and useful addition to this series of monographs.

E. L. Taylor.

WIELENGA (Douwe Klaas). **Onderzoekingen over het scleroma respiratorium en de groep der kapselbacteriën.** [Rhinoscleroma in the Netherlands Indies.] [Thesis for Doctorate of Medicine at Amsterdam University.]—153 pp. With 1 map, 5 graphs & 12 figs. on 3 plates. [113 refs.] English summary pp. 145–148. 1937. Amsterdam : N.V. Noord-Hollandsche Uitgeversmaatschappij.

This work is an excellent review and study of a condition which is common in the Netherlands Indies and seen, though less commonly, in the United States and in South America. The subject is dealt with in six chapters. The first contains a review of recent literature of a critical character and a consideration of the chief diagnostic features. Clinical signs alone are not adequate, the finding of *Klebsiella scleromatis* should be regarded as essential. Evidence of contagiousness is accumulating. The second chapter recounts its prevalence in the Netherlands Indies, 70 cases being known in the Batak area, 42 in Bali, 15–20 in the Minahasse and rather fewer in Java and other parts. Foci seem to be scattered along lines of travel. The author breaks new ground in suggesting that gangosa may be a special manifestation of the disease. Next follow chapters on the bacteriology and serology of the condition. To obtain good growth of the *Klebsiella* material should be taken from the deeper layers of the tissue and not from the nasal mucus. Identification and differentiation from other organisms are made by a study of the capsule antigens, for details of which the original must be consulted. The fifth chapter gives an account of an investigation of the nasal flora and shows that the organism in question is absent from normal subjects and that the idea that it is ubiquitous and a chance concomitant is not tenable. Finally, the author's attempts to reproduce the condition in animals by inoculation are described. Though scleroma could not be produced, in the liver and spleen of the experimental animals, monkeys, rats and mice, cells indistinguishable from Mikulicz cells were seen and these are a characteristic feature of human scleroma tissue. The book is furnished with a fairly full bibliography of more than a hundred references. There are two photographs of patients showing well the condition and several well-reproduced photomicrographs of the organism, cultures and pathological histology. H. H. S.

SOEHARTO (Raden). **Over zweren in maag en duodenum bij Inheemschen en Chineezen in Nederlandsch-Indië.** [Gastric and Duodenal Ulcers in Chinese and Malays.] [Thesis for Doctorate of Medicine, Medical High School, Batavia.]—93 pp. [38 refs.] 1937. Batavia-C. : G. Kolff & Co.

[Geographical, racial and sex differences in the incidence of disease may serve to throw light on causation and are well worth investigating. The subject of the incidence of gastric and duodenal ulcers in Malays and Chinese has received considerable attention from workers in the Netherlands Indies and reference may be made to KOUWENAAR (this *Bulletin*, 1931, Vol. 28, p. 42) and BRUMMELKAMP (this *Bulletin*, 1934, Vol. 31, p. 349).] The author reaches the same conclusions as these authors regarding the significantly greater incidence of gastric ulcer in Chinese men than in Malays, as previous workers have done. On the other hand duodenal ulcer is not so common in Chinese men as gastric ulcer ; the reverse is the case among the Malays. In statistics such

as these, the age distribution of the several populations has to be taken into account and this is done by the author when he restricts his principal figures of comparison to persons older than 20 years. For Chinese males, Chinese females, Malay males and Malay females the percentages of incidence, as determined in the post-mortem room, were respectively : gastric ulcer, 3.6, 0.6, 0.3 and 0.4 per cent. ; duodenal ulcer, 2, 0.6, 0.4 and 0.5 per cent. Probable errors accompany these percentages. No explanation is forthcoming of the reasons for the differences between Chinese men and Malay men or for those between Chinese men and women.

W. F. Harvey.

- i. MITCHELL (John P.) [O.B.E., M.D., Med. Supt., Mulago Hospital & Principal of the Uganda Medical School]. **Anatomy and Physiology and Causes of Disease.**—pp. xvi + 215. With 87 figs. Baillière's Medical Manuals for Africans. Vol. 1. 1937. London : Baillière, Tindall & Cox, 7 & 8 Henrietta Street, Covent Garden, W.C.2. [2s. 6d.]
- ii. BAGOT (Ruth A.) [M.B.E., Lady Superintendent of Nurses, Uganda]. **Nursing.**—pp. xii + 183. With 136 figs. Baillière's Medical Manuals for Africans. Vol. II. 1937. London : Baillière, Tindall & Cox, 7 & 8 Henrietta Street, Covent Garden, W.C.2. [2s. 6d.]

These small volumes comprise two of a series of handbooks written for the instruction of African nurses, dispensers and health orderlies, the first by the principal of the Uganda Medical School, the second by the lady superintendent of nurses, Uganda.

i. Dr. Mitchell in the first part of his book has succeeded in giving, in 155 pages, an account of the elements of anatomy and physiology which is simple and clear. In the second part of only 50 pages he deals with the causes of disease including the whole of parasitology. This very abridged account of a subject, which is of such overwhelming importance in tropical Africa, seems hardly adequate. It may be all that the author deems it necessary to teach his native students, but it might well be worthy of a separate volume. The author states "an endeavour has been made, while avoiding a child-like style, to simplify the text by excluding idiomatic expressions" and in this he is to be congratulated.

It is not obvious why in a book of this kind references are made to HARVEY, PASTEUR and LISTER to the exclusion of all others, nor does it appear relevant to drag in the story of David and Goliath when dealing with the thymus and pineal glands.

ii. Miss Bagot has had an easier task, her contribution might well have been written for use by nurses in this country. The principles underlying the practice of nursing and the methods to be adopted in treating the patient are well displayed. The book will be found a most useful one, and the introduction upon nursing ethics and hospital etiquette are worthy of red lettering.

In anticipation of a second edition in the near future there are a few points which might be added with advantage.

It is advised that iron beds be treated with pesterine to prevent bug infestation. It might be worth while saying what pesterine is and give some alternative method. Lice and delousing are not mentioned. Nail brushes "are to be boiled once a day" but mention is not made of how they should be stored. The washing of mugs, feeders, sputum

mugs, bed pans, urinals, etc. is referred to, but the place where they are to be washed receives no notice and the disinfection of the latter articles is only advised apparently in enteric fever and dysentery. Soiled dressings are to be thrown into a dust bin, but the type of bin and cover and the disposal of its contents are not dealt with. The expression "linen soiled with faeces must be mopped out" is not clear. One is sorry to see that though reference is made to the necessity of treating the folds of the buttock, the groins and the under surfaces of the breasts by washing, etc., nothing is said, as usual, about the genitals. This is a black spot in nursing all the world over. There are three points upon which many will disagree with the author: the routine use of castor oil in preparation for operation, the use of soap in a simple enema, and the giving of sugar cane (sic) for 3 days before operation. Omissions are few, but under causes of offensive sputum no mention is made of bronchiectasis. More might have been said in regard to diet; only two diets are mentioned, that for typhoid and that for pneumonia. In regard to the former it appears dangerous to the reviewer to include sugar cane! There is no reference to mosquito nets.

H. S. Stannus.

CURRENT TITLES FROM BIOLOGICAL JOURNALS. A REGISTER OF SELECTED TABLES OF CONTENTS. 1937. May. Vol. 1. No. 1. 76 pp. [Review appears also in *Bulletin of Hygiene*.]

The new periodical "Current Titles from Biological Journals" promises to render a useful service to biologists and other research workers by providing them, at small cost and promptly, with photo-printed copies of the tables of contents of current bio-medical journals, so that they may select for themselves the articles likely to have a bearing on their work from the hundreds of journals being published in their own and related fields. The first number of "Current Titles" issued in May 1937, gives 147 tables of contents from selected journals published in the weeks immediately preceding its appearance. These journals include 40 dealing with general biology and medicine, 15 with anatomy, 22 with bacteriology, immunology and public health, 13 with parasitology and tropical medicine, and 30 with physiology, biochemistry and pharmacology. Those wishing to receive "Current Titles" for the remaining months of 1937 can do so on sending a remittance of \$1.50 to the Editor (L. R. KUHN) 5603, Drexel Avenue, Chicago, Illinois, U.S.A.

R. L. S.

BUREAU OF HYGIENE AND TROPICAL DISEASES.

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[No. 10.]

TUBERCULOSIS IN THE TROPICS.

PART I.*

A SURVEY OF TUBERCULOSIS IN THE TROPICS.

By E. COCHRANE, M.D. (Glas.), D.P.H. (Lond.).

Introduction.

The problems associated with the control of tuberculosis in the tropics are steadily attracting more attention.

JAMESON (1934) said, following his tour of the East to investigate at first hand the public health problems to be met with there, "tuberculosis is just as serious a killing disease in many parts of the tropics as it is in Europe."

LANKESTER (1920) in India, WILCOCKS (1928) in East Africa, DAKE (1928) in the Dutch East Indies and BARRETO (1934) in Brazil, have all drawn attention to the seriousness of the health problem in their respective countries. AYCARDO (1934) said tuberculosis was the most serious health problem in the Philippine Islands in rural as well as urban areas. SELWYN-CLARKE (1935) wrote: "Tuberculosis is not a showy 'tropical' disease and for this reason may fail to receive the public attention it merits. It is capable of killing throughout the length and breadth of the Gold Coast, and from a health standpoint is the most important problem for the future."

The only survey we have of the incidence and distribution of tuberculosis throughout the tropics is that of MCKINLEY (1935). Even this gives us but a scanty idea of the extent to which this disease is present, but it is interesting to note that without exception it is considered to be of public health importance in all the countries passed under review.

The original intention of this work was to furnish an account of anti-tuberculosis measures in a small tropical community, to outline the problems encountered in such work, and to describe the methods employed in overcoming them. Before doing this it was considered advisable to undertake a comparative study of the problem in other tropical countries.

The medical officer stationed in the tropics rarely has the time or opportunity for studying the work of other investigators. Further,

* The full list of references will be printed at the end of the second part in the November issue of this *Bulletin*.

apart from a specialized course in tropical diseases, he has received his training from teachers unfamiliar with the aspects of the disease in warm climates. On taking up his duties abroad, he finds with respect to tuberculosis, a very different state of affairs from that which exists in temperate climes. His resources are too often scanty, he may have to deal with a population entirely ignorant of the most elementary laws of hygiene, and he will search his text-books in vain for an answer to the problems of pathology and treatment that face him in his tuberculosis work abroad.

The first part of this work, therefore, has been devoted to selecting, as far as possible, the more important contributions regarding tuberculosis amongst coloured peoples. Also, in certain sections, especially that on pathology, these articles have been set out in considerable detail in the hope that the information contained therein will be of value to those who have to wage a single-handed warfare against this disease.

Epidemiology of Tuberculosis in the Tropics.

Undoubtedly the first observer to arouse interest in this question amongst British workers was CUMMINS (1912) who, as a result of his observations in the Sudan, pointed out that tuberculosis was practically non-existent amongst people living under primitive conditions, but transported from their natural surroundings to a civilized habitat these very people were far more liable to contract the disease.

In France, CALMETTE's (1912) account of tuberculin tests (von Pirquet) in the French colonies furnished an index of the extent of the disease in hitherto unsurveyed countries. ZIEMANN's (1913) article on tuberculosis in the tropics gave further encouragement to the view then slowly gaining ground that tuberculosis was by no means unknown in other than temperate climes. BUSHNELL (1920) has reviewed the various contributions to medical literature during these earlier years and there is no need to cover the same ground.

The advent of the European war, however, stimulated research on a larger scale than had been possible hitherto. Peoples of many races, Africans, Chinese, Indo-Chinese, Malagasy, Polynesians, West Indians, were transported to the various theatres of war. These peoples, many of them without any previous contact with the highly tuberculized Europeans, besides being subjected to the strain of war conditions, adopted a mode of living entirely different from that of their natural surroundings. The result was a heavy mortality rate from tuberculosis and the consequent opportunities for pathological and clinical studies which have since formed the basis for comparison with work of a similar nature throughout the tropics.

The best known of these investigations were those of BORREL (1920) and ROUBIER (1920) with their detailed clinical and pathological findings in members of various coloured races. There followed numerous researches on the part of observers in the United States on the post-mortem findings in Negroes who had succumbed to the disease. The result of these and other findings, which will be referred to later, enable us to understand the force of VASSAL's (1928) dictum that "tuberculosis of primitive peoples has an epidemiology of its own."

CUMMINS (1929) pointed out that acute progressive tuberculosis is not invariable when infection takes place in virgin soil. It is not necessarily a high morbidity that is present following such an infection but a high case mortality. If infection in this virgin soil produces

latent lesions they tend to be well tolerated but should the disease become manifest then the result is serious. If we consider the age period between early childhood and the onset of puberty we find a high degree of resistance to, and little manifestation of, tuberculosis. The dangerous period of infancy with its acute type of tuberculosis has been left behind, in front there is the pubertal period with its threat of the adult form of phthisis; this childhood period of calm is the one at which tuberculosis mortality is at its lowest. Cummins terms this the larval period and at this stage the fate of the individual often hangs in the balance. In these childhood years good diet and adequate rest, healthy exercise in the open air and freedom from responsibility result in physical fitness and general well being.

At puberty much of this is changed and new stresses and strains assail the body. Here the larval stage with lesions latent and as yet unresolved results often in a considerable degree of auto-inoculation which in turn produces a high degree of tissue allergy in a short time. At the same time but infinitely more slowly there occurs the gradual formation of cellular proliferations and protective barriers of fibrotic tissue, the evidence of spontaneous healing. The existence of unnatural stress or abnormal physiological conditions during this larval period may so increase the degree of auto-inoculation as to bring about, not an established immunity, but manifest lesions and acute disease.

This description by Cummins of the onset of tuberculosis in a serious form is borne out by the investigations made by the South African Institute for Medical Research (1932) amongst the mine labourers on the Witwatersrand. Here the sequence of events amongst "a relatively primitive race impelled to change its manner of living from that of a pastoral and warlike people to one of industrialism associated with increasingly close contact with Europeans and to some extent with urbanization," throws considerable light on what has happened in many other parts of the tropics.

It was found that natives applying for employment who reacted positively to intradermal tests were more liable to develop manifest tuberculosis than those who were negative. It appears that this allergy denoted that resistance to infection was lowered and further, the greater the amount of allergy the lower the resistance. However, that this allergy does bestow some degree of resistance is evident from the observation that the septicaemic type of tuberculosis occurred most often amongst those natives who had not reacted to the test. It seems probable that the evidence of this acute phthisis occurring in native recruits shortly after commencing their mine service can be correlated with the view that in these natives a partially natural tuberculosis modified by environmental circumstances has attained an intermediate stage between the tuberculosis of virgin soil and the localized tuberculosis of the European. In support of this we find that the case mortality in the first year of employment in the mines is twice as high among the natives as it is in the White workers. The investigators considered that there did exist "a biological lack of resistance," unconnected with any risk inseparable from the industry itself and that it was a biological characteristic of Africans nor could it be eliminated save by the adoption of industrialism over a long period of time.

That the recruits to the mines have already come into contact with the infection of tuberculosis was proved by ALLAN (1932) who carried out a series of tuberculin tests in the recruiting territories, the

Transkei and the Ciskei, and found that 74% were positive to 0.1 cc. 1 : 5000 O.T. This exposure to infection in their own kraals did not lead to any great degree of active disease ; it did, however, produce latent lesions which remained controlled under the natural conditions of their home life. Amongst those who sought employment in the mines this latent stage led to manifest tuberculosis due to the crowding together of men in an environment where the housing conditions, the diet and the mode of occupation were completely different.

As CUMMINS has already pointed out, in the European child tuberculosis infection usually occurs during the favourable period of home life and the lesions in the majority of children remain larval. Throughout childhood and adolescence the child encounters a succession of minor re-infections and is thus enabled to build up a degree of resistance which minimizes the risk of active tuberculosis. In the African native there is no gradual progression from stage to stage, he is thrust suddenly into the routine of labour in the mines straight from the kraal. This abrupt environmental change coupled with the lack of resistance which characterizes the African lessens his chances of overcoming the disease.

Another study of the epidemiology of tuberculosis amongst a primitive people, though not inhabitants of the tropics, is furnished by FERGUSON'S (1928) history of the spread of tuberculosis among the Indians of the North American continent. Until the early years of the decade 1870-1880 tuberculosis was, from authoritative accounts, rare among the North American Indians. By 1884, it has flared up in such a fashion as to resemble an epidemic, the death rate actually rose to 90 per 1,000 in 1890. This acute phase lasted throughout two decades and then gradually subsided but the death rate at the time of his report stood at 8 per 1,000, almost twenty times that of the surrounding population.

In the acute phase of the invasion adenitis was the commonest manifestation and affected the Indians at all age periods ; to-day the children who form the third generation rarely show any evidence of adenitis. The first generation of the epidemic, that is, those infected for the first time in the adult age period, suffered heavily, 28.86% fell victims to the disease. The second generation contracted the infection in childhood and was even more severely afflicted, 32.7% died of tuberculosis. The present generation, which forms the third of the series, children of parents tuberculized in childhood, has acquired a certain degree of resistance ; 20.46% of these have succumbed but the ultimate mortality is not expected to exceed 22.6% by the time the fortieth year is reached.

ANDERSON (1928) from a study of the evolution of tuberculosis in Mauritius asserts that in a hitherto unexposed people resistance to the disease begins to be acquired within thirty years of continual exposure, is appreciable in extent after fifty years, while full resistance is developed in more than one hundred but less than two hundred years.

Tuberculin Tests in the Tropics.

During recent years tuberculin testing has been undertaken in most tropical countries. It would be beyond the scope of this work to tabulate all the findings but a few are included in order to obtain some idea of the extent to which the infection has gained a foothold in the tropics.

Information regarding wide scale surveys in Central and South America is lacking but the investigations which have been recorded are significant. KRUMDIECK (1931) testing 800 children in Lima by the von Pirquet and intradermal tests found positive reactions rose from 3.1% under twelve months to 75% in the 10-15 years age group. CAYCEDO (1933) tested, by the von Pirquet method, 3,166 school children in Bogotá, Colombia. At the age of five years, 17.3% reacted positively and this increased to 54.1% among the thirteen year old children. MACHADO and BALDÓ (1934) examined 811 infants and young children in Caracas, Venezuela, the positive reactors ranged from 2.17% at three months to 84.61% at five years. CHAVARRÍA *et al* (1935) working in Costa Rica found that of 1,534 children of all races in urban areas 40-45% were positive to the Mantoux test by the time they reached fourteen years of age. In rural districts the total did not exceed 20% at the same age period.

The extent of tuberculization in some parts of India may be deduced from the investigations of PAI and VENUGOPAL (1926) who carried out von Pirquet tests on 3,372 persons in Madras City, by the end of the first year of life about 40% were infected, 57% at the end of the second year and this rose to 80% in the fifth year.

In the Dutch East Indies, PANETH (1928) in the Karo district, a mountainous area in the Interior of Sumatra, Mantoux tested 7,300 individuals and obtained 74% positive reactors. DJAMIL (1929) carried out a comparative study in two villages in the Sumatran highlands. He noted that 40% reacted positively in a village where home industries were pursued, especially the craft of goldsmith, whereas in another village where the pursuits were mainly agricultural only 20% were positive. In Batavia, DE HAAS (1933) testing 596 Chinese infants and young children by the von Pirquet method obtained 21% positive reactions in the first year of life and 45% in the fourth year. A further series of older children recorded by DE HAAS *et al* (1933) revealed a rise to 80% in the 10-14 year age group.

CALMETTE (1912) published the first account of tuberculin tests in the French Colonies, his table is of great interest in comparison with subsequent investigations, especially in Africa.

Senegal	... 15.1%	positive to the Von Pirquet Test.					
Madagascar	... 7.0%	"	"	"	"	"	"
Fr. Guinea	... 1.8%	"	"	"	"	"	"
Ivory Coast	... 8.4%	"	"	"	"	"	"
Fr. W. Indies	41.0%	"	"	"	"	"	"
Indo-China	... 31.4%	"	"	"	"	"	"
Reunion Is.	... 52.4%	"	"	"	"	"	"

MATHIS and DURIEX (1930) discussing the spread of tuberculosis in French West Africa, point out that by 1930 the general average of positive reactors had risen to 44%. TOULLEC and JOLLY (1932) tuberculin tested 285 African soldiers landing at Marseilles direct from the Ivory Coast; of these, 46% reacted positively, a markedly different result from that of Calmette's twenty years earlier. LEDENTU (1934) tested von Pirquet 12,251 children in the French Cameroons, ranging from infancy to fifteen years of age. In the urban districts 22.5%, in rural districts 15.8%, reacted positively. In the Belgian Congo VAN HOOFF *et al* (1926) obtained one-third positive reactions amongst the school children of Stanleyville, while VAN DEN BRANDEN (1926) records that one-half of the adults tested by the von Pirquet method in Léopoldville reacted positively.

In South Africa in a large series of tests 72% of the mine labourers in the Witwatersrand applying for an engagement were positive to 0.1 cc. 1 : 5000 O.T. (Mantoux). Moreover the investigators were of the opinion that by using a less dilute solution of O.T. the total positives would have amounted to nearly 90%. In this connexion CUMMINS (1934) commenting on a group of Africans tested with high dilutions, noted that no fewer than 48.6 reacted to 1 : 10,000,000 O.T. CUMMINS and EVANS (1933) had tested a group of 304 male inmates of a Welsh mental hospital and only 3% reacted to such a high dilution of O.T. In his opinion this reaction to high dilutions on the part of the African Native suggests that there is present a latent infection of such severity as to be barely below the clinical level.

A recent study carried out in Africa by three British observers in widely differing localities has yielded a number of interesting results. BURROWS (1934) made a series of intradermal tests on the Dinkas of the Southern Sudan; these people are mainly cattle owners and lead a semi-nomadic life. Tuberculosis was unknown among them until the early years of this century when infected aliens, traders from Northern Africa, settled in their midst. Since then the disease has spread slowly throughout the community despite the fact that their customs, habits of life and environment have undergone no change.

3,662 were tested, 0.1 cc. of 1 : 5000 O.T. (Mantoux) Positive 32.7%.

Under 5 years ...	...	...	...	...	7.5%.
5-10 years ...	...	...	...	...	19.6%.
10-25 years ...	...	...	...	...	36.1%.
Over 25 years ...	...	...	...	...	50.76%.

WILCOCKS (1934) similarly tested Africans in Tanganyika and of 523 adults of both sexes:—

51%	...	...	...	...	0.1 cc. 1 : 500 O.T.
47%	"	"	"	"	1 : 5,000 O.T.
43%	"	"	"	"	1 : 50,000 O.T.

He, too, observed that the African Native reacted to a very much more dilute tuberculin than does the European.

MATTHEWS (1934) obtained in Zanzibar, where a medley of races is to be found and constant immigration is maintained in small numbers from the Orient, in the urban area 67% positive male reactors and 64% positive female reactors. In the rural districts the percentages were 26 and 23 respectively. In the age group 20-39 years amongst town dwellers 71% reacted, whilst half of the children had become infected by the tenth year and two-thirds by the twentieth year.

It is evident from these surveys that even in the more remote portions of Africa tuberculous infection is widespread, while in those regions open to contact from other continents there is a high degree of tubercularization.

As HART (1932) stated, it is difficult to make comparisons between the various tuberculin surveys because of the differences in technique and in the strength and potency of Old Tuberculin available in different parts of the world. He advocates a uniform technique and the employment of a tuberculin standardized in terms of potency with the International Standard Tuberculin. One of the difficulties encountered in the tropics is the necessity for making up dilutions of O.T. at frequent intervals. Diluted tuberculin should not be used after

fourteen days in warm climates and has during that period to be kept in a refrigerator, a piece of apparatus not available everywhere. The usual intradermal tests necessitate the presence of a laboratory where the solutions can be made up accurately and where they can be kept for the requisite period at a suitable temperature.

Further, the actual use of a hypodermic syringe is resented in some of the more backward portions of the globe, and the difficulty of persuading patients to come up for repeated tests is very great. CRAIG (1933) introduced a method which he claims to be simpler in technique than either the von Pirquet or the Mantoux test and as reliable. The instrument used consists of a short handle with five needle points at the end. A drop of undiluted O.T. is placed on the forearm and the instrument held at a right angle to the treated area and firm pressure employed until the points have penetrated the superficial layers of the skin. This method deserves to be more widely known since it has two important features to recommend it, the use of undiluted O.T. which is unaffected by tropical conditions and the employment of an instrument less feared than the intradermal syringe.

LONG (1935) would have us abandon O.T. altogether since the varying potencies of brands lead to lack of accurate comparison. O'BRIEN (1925) testing twelve samples of veterinary tuberculin from various countries, found a great variation in the potency of the different brands, they varied on the potency scale from 200 to as low as 20 or less. LONG *et al* (1935) in their consideration of this question of a standardized tuberculin describe the method of isolating the active principle of O.T. made from cultures grown on synthetic media of known chemical composition. The product so obtained can be used in solutions of accurately weighed amounts or it can be mixed with an inert, soluble substance, *e.g.*, lactose, and made into tablets, each containing such an amount that 0.1 cc. of appropriate solutions delivers the required dose. They recommend that five minutes should be allowed for dissolving the tablets.

This product is now known as P.P.D. (purified protein derivate) and as a result of its keeping properties in all conditions, its invariable potency and handy tablet form, bids well to be the preparation of choice for all tropical workers. Surveys carried out with P.P.D. have yielded satisfactory results, though PALMER *et al* (1936) performing comparative tests with P.P.D. and O.T. on 294 Negro school children, report that the former is not, in their opinion, superior in its results to O.T. at least in the case of the Negro.

Influence of leprosy on tuberculin tests.—The question has been raised as to the possibility of the presence of leprosy vitiating the results of tuberculin tests. Some workers consider that a positive reaction in a leper is to be expected, apart from the presence or otherwise of tuberculous infection. DUBOIS (1932) during his tour of duty in the Belgian Congo, carried out cutaneous and intradermal tuberculin tests on a large number of lepers and controls with a view to settling this point. He was convinced, as a result of these investigations, that in a leper a positive tuberculin test is evidence of a tuberculous infection.

Pathology of Tuberculosis in the Tropics.

No record of the spread of tuberculosis can be complete without a study of the pathology of the disease in various races and countries. Nor is this a field of work that can be neglected; numerous workers

have performed series of post-mortems large and small, and their findings have contributed greatly towards solving some, at least, of the epidemiological questions which confront us.

CLARK (1915) analysed the records of 703 autopsies performed in the Panama Canal Zone, the majority of the subjects being Negroes from the West Indies. He recorded that as a rule tuberculosis was the cause of death and rarely a coincident disease. Evidence of old infection in the form of calcified thoracic glands, apical scars, etc., were encountered far less frequently among Negroes than Whites. Nor was there much evidence of fibrous tissue formation in the lungs of Negroes dying of tuberculosis, apart from the obliteration of pleural cavities by adhesions. Surgical tuberculosis was rarely seen in contrast with Europeans. Practically 50% of Negro cadavers showed that some of the abdominal organs were involved in the dissemination of tuberculosis throughout the body. Acute miliary tuberculosis was not infrequent, occurring in approximately 10% of tuberculosis deaths.

BORREL (1920) by his description of the pathological findings in coloured troops dying of tuberculosis in France during the war, has placed on record for all time a picture of the state of affairs that eventuates when the seeds of disease are sown on virgin soil. He laid great stress on the presence of one or more enlarged lymph nodes in the subclavicular region, "ganglions susclaviculaires." These were situated in front or behind the insertions of the sternocleidomastoid and were present in 70% of post-mortems either as a primary infection or as a spread from the infected tracheobronchial nodes. In 80% the tracheobronchial nodes were tuberculous, presenting changes of caseation and were manifestly the point from which further spread took place. The extension of the disease was due either to rupture of the node or by lymphogenous or haematogenous spread. These enlarged lymph nodes varied in size from a cobnut to a hen's egg.

Caseous pneumonia of a lobe was noted in 30%, in 20% of cases caseous pneumonia with miliary spread of tubercles in the lungs was present. Miliary tubercles were recorded as present in the lungs, spleen, liver, suprarenals and meninges in 25%, as BORREL aptly put it "it snowed tubercles." In 10% there was a pleuro-peritoneal spread by contiguity. Chronic tuberculosis formed only 5% of the total findings, caseous changes were seen in the apical regions without any involvement of the mediastinal glands, cavitation was rarely present. Abdominal tuberculosis was uncommon, while surgical tuberculosis was rarely encountered. Borrel notes that the subclavicular glands were seen twice as frequently in the Senegalese as compared with the Malagasy.

CLFLAND (1912) described the post-mortem findings in two Australian Aborigines, a race hitherto untouched by tuberculosis. Here massive caseation was present in the lungs with caseous changes in the mediastinal glands and tubercles scattered through the spleen, kidney and liver.

SCOTT (1921) in his investigation into the prevalence and types of tuberculosis in Hong Kong, found that of 300 autopsies in 72% entry was made by the respiratory tract, in 12.33% by the alimentary tract. Excluding all cases over ten years of age, the majority of the post-mortems being on Chinese children, of the 225 children, 65.77% exhibited a primary infection by way of the respiratory tract, 13.77% by alimentary. He considers it is probable that where the primary focus is located in the intestine the means of entry was by the ingestion of

Myco. tuberculosis from dried sputum in infected buildings. He noted :—

(a) The almost constant findings of a primary focus in the lung whenever there was involvement of the hilar nodes and the close anatomical relationship of these nodes to the primary focus. There was no evidence of a focus in the lung parenchyma despite the presence of caseous mediastinal nodes in 29 instances.

(b) In the great majority of cases the primary focus in the lung was single.

(c) Wherever a lung focus was recorded it was accompanied by affection of the root glands. It is interesting to note that Scott lays emphasis on the absence of the above condition in adults and its almost invariable presence in children. In children it was present in all but twelve cases and evident to the naked eye. In four of these, however, there was microscopical proof of infection of the lymph nodes. Tuberculosis of bones, joints or skin was rarely encountered.

LASNET (1922) during his tour of duty with the army of the Rhine, records the presence of enormous cavities almost taking up the whole of one lobe in Senegalese who had succumbed to tuberculosis. Otherwise the pathological findings were similar to those of BORREL. In other races, Arabs, Annamites and Malagasy, the post-mortem findings were more in accord with those of Europeans, though they showed that a more acute process had been at work.

LAMBERT and DE CASTRO (1925) commenting on 402 autopsies performed at a large hospital in Brazil, state that the characters of the tuberculous lesions in the Brazilians, particularly those of white stock, indicate a fairly high degree of immunity comparable with that seen in Europe and N. America. In the Negro, despite the passage of several generations in contact with other races, there was marked rarity of healed lesions and noticeable frequency of a generalized pneumonic type.

VINT (1929) recording 176 post-mortems on Africans of Kenya, ascribes the cause of death to tuberculosis in 16 (9.1%). Healed lesions were rarely met with and it was unusual to find any fibrous tissue formation around the lesions. The commonest form of the disease was miliary tuberculosis. Both lungs were filled with tubercles and in eight of the cases cavities were seen, but in only two were they larger than a bean. In some the condition closely resembled a tuberculous pneumonia. No naked eye lesions were seen, either in the brain or meninges, even when the disease was general throughout the body. All the organs in the abdominal cavity except the pancreas were found to be invaded at one time or another.

SITSEN (1928) in a report on 1,400 autopsies performed in Java, records tuberculosis as the cause of death in 292 instances.

The pathological appearances showed that the process of invasion was definitely chronic; cavities with smooth organized walls, encapsulated caseous foci and pleural adhesions were frequently noted. Yet there was evidence of acute spread in a number of cases in the shape of widely disseminated miliary tubercles and small pneumonic foci. There was macroscopic evidence of the presence of tubercles in various organs, liver, spleen and kidneys, and the number of cases with spread throughout these organs was still further increased on microscopic examination. This was most evident in the case of hepatic spread, in 80 cases tubercles were detected in the liver and

this number was further increased by 50 when sections were prepared and examined. Sitsen states that in Malays tuberculosis of the lungs often follows a similar course to that seen in Europe but shows a greater tendency to become acute.

UKIL (1929) in post-mortem findings from Calcutta, Madras, and Patna comprising 1,529 dissections, found pleural adhesions present in a large number and these were both multiple and extensive. Enlarged bronchial nodes were present in most of the fibrocaseous types, a large proportion of hilar nodes (30-50%) showed well marked caseation and little fibrosis. The prevailing type was fibrocaseous with localization of the disease in the lobes. In these cavity formation was generally present and multiple cavities in 14%. In the majority of the cases in the age period 15-30 years, the walls of these cavities were ragged and caseous and encircled by tubercles. Over one hundred cavity walls were sectioned and well marked development of fibrous tissue noted in 10%, moderately marked in 10% and feeble or absent in the remainder. The result was that the lesions spread extensively with involvement of both lungs 62%, and miliary dissemination in 42%. Exudative changes were a much more prominent feature of phthisis than proliferative, the latter only being found in individuals over forty years of age reared in thickly populated districts. Tuberculous broncho-pneumonia with great enlargement of the hilar nodes was seen in a few adolescents, 2.3% in the age group 15-20 years. Ukil quotes ROGERS' findings of meningeal spread in only 5.0% of Indian children under ten years of age as compared with 62.7% in London.

OPHE (1930) in a small group of nine autopsies performed on members of the Negro race in Jamaica, noted that five adults had pulmonary tuberculosis of the childhood type, *i.e.*, located in nonapical areas with involvement of the nodes draining the areas. In one, the lesion was in the apex, but otherwise the infection was of the childhood type, in two more the pathological appearances found in the lymph nodes were intermediate between those of childhood and adult life. In only one were the characteristics of pulmonary tuberculosis as seen in the European adult encountered.

The Witwatersrand (1932) investigations included 200 autopsies and the findings were compared with series recorded in England.

i. There was a far greater involvement of the lymph nodes all over the body in the Africans.

ii. Lung lesions were less extensive as well as less constantly present in the African, while scarring, fibrosis, pleural adhesions and cavitation were less often encountered.

iii. Involvement of the spleen and liver was very much more common in the African and, in addition, tuberculous peritonitis, and infection of such abdominal organs as the suprarenals and genitals.

iv. Both laryngeal infection and meningeal lesions were less frequently recorded. This cannot be accepted as strictly accurate since these complications were not systematically sought.

Post-mortem findings in a small group of Eurafricans suggest that among coloured people the type more closely approximates to the European form of the disease than to the African type, the number of dissections performed was too small to draw definite conclusions. A terminal miliary spread was often seen when the groups of lymph nodes exhibited extensive caseation. Tuberculous lobar pneumonia was recorded in only two cases. That a certain amount of resistance

is to be found in the Africans is evident from the fact that while many cases had massive initial caseous lesions in the nodes, especially of the tracheobronchial groups, with secondary spread to the lungs or with a generalized miliary spread, yet a proportion showed extensive changes in the upper lobes with little or no change in the hilar nodes.

PINNER and KASPER (1932) in a review of 303 autopsies of coloured and 219 of white persons of all ages, from infants to sexagenarians, dying of tuberculosis, tabled the occurrence of miliary tuberculosis in 37·7% of coloured persons as compared with 15·5% of whites. Haematogenous propagation was twice as common in Negroes as in Whites except for the first decade, when the percentages were equal. Also, the Negro showed a far higher incidence of lymphatic spread in all age periods, even in the second decade, than did the White. The resistance of the Whites also in the first twenty years of life was superior to that shown by the Negro at all ages. The most characteristic features of tuberculosis in the adult Negro were :—

- i. Massive lymph node caseation.
- ii. Massive exudative lesions which overlapped the normal anatomical boundaries of the organs. This type of lesion was infrequently encountered, but when it did occur was almost always present in the Negroes.
- iii. A type of generalized tuberculosis without the formation of miliary tuberculosis, but with irregularly scattered nodular, exudative foci. These lesions were more or less spherical, measuring up to 2 cm. in diameter and scattered widely through the different organs. The distribution was densest and the lesions largest in spleen and lymph nodes and sometimes in the lungs. The smaller foci were usually found in liver, kidneys, genitals and serous membranes.

No claim is made that the characteristic changes outlined above were solely to be seen in the Negro but they were very rarely seen in the White. The type of fibrotic pulmonary tuberculosis of the European with its huge cavities, fibrous strands and thickened pleura was seen four times as frequently in the White as in the Negro. Cavities in the Negro were frequently small, necrotic and more or less filled with liquefied masses. The authors emphasize the fact that one does meet with the chronic, fibrotic appearances in the Negro as well as caseous tuberculous lobar pneumonia in the White but the general picture obtained is the thin sprinkling of Blacks with chronic disease and the equally small number of Whites with massive exudative lesions.

EVERETT (1933) noted that in 402 autopsies performed tuberculosis was the cause of death in 44 coloured and 21 white persons, in two of the former tuberculous peritonitis was terminal. As far as possible roentgenograms were obtained prior to death; these were repeated after death and then the excised lungs were inflated and X-rayed once again. By these detailed methods of examination it was possible to obtain evidence of latent lesions in the 335 in whom tuberculosis had not been the cause of death. It was found that of this group 197 Whites and 109 Coloured persons had latent tuberculous lesions in the lungs.

Analysis of the type of disease present in the tuberculous group demonstrated the fact that a considerable number of pulmonary lesions in Negro adults originated in the apical regions of the lungs and the adjacent lymph nodes were involved. Thus the course of the

disease in these victims was intermediate between the adult and the true childhood form :—

Race	Childhood Type		Adult Type	Abdominal	Latent Tuberculous Lesions	Non-Tuberculous	Total
	Extra Apical Lesions	Apical Lesions					
White ...	1	1	19	0	197	12	230
Negro ...	9	13	22	2	109	17	172

The group of 22 Negroes showing lesions of the adult type ranged from 20-49 years. In some there was more or less widespread tuberculous broncho-pneumonia ; in others, lobules or groups of lobules were the seat of the same process. There were nine cases of massive caseous pneumonia ; this was defined as massive when there was consolidation of a whole lobe or its equivalent. All the 22 cases exhibited cavities, in 14 the walls were sharply defined, organization being present since the cavity lining was smooth. In 5 others the walls were ragged and necrotic, while in the remaining 3 both stages were observed.

The group of nine Negroes with the true childhood type of the disease ranged from 17-44 years. The caseating mediastinal nodes and the affected pulmonary areas varied in size from small foci 2-3 mm. across to almost homogenous masses measuring as much as 10×5 cm. The number of nodes showing change varied from 1-21. Five of these nine cases had cavities. The group of 13 Negroes with localization primarily in the apices and caseating mediastinal nodes were from 17-45 years. Massive tuberculous pneumonia was noted in 8 ; all had cavities, five had necrotic walls and in 8 the walls were organized. The two cases of tuberculous peritonitis were female Negroes aged 23 and 25, respectively.

As a complication tuberculous peritonitis occurred in 5 of the 22 Negroes with childhood type of disease and in 1 of 22 with the adult type, none was seen in the series of 21 Whites. Acute miliary tuberculosis occurred in only 2 of the whole series and in both was associated with the childhood type of extra apical tuberculosis in Negroes. Tuberculous meningitis was seen twice, both cases being in adult Whites.

Marked fibrosis was present in 14 of the 19 cases of adult type in Whites and only in 4 of the 22 Negroes, all the Whites had cavities and in only one were the walls seen to be necrotic. LONG (1934), commenting on the pathology of thoracic tuberculosis, said there were many cases which could not be classified on a strictly anatomical basis as either the adult or the childhood type of tuberculosis. Such cases have large apical or subapical cavities of the adult type and with these gross enlargement and caseation of the tracheo-bronchial lymph nodes. This condition is frequently met with in Negroes and is not uncommon in White adolescents and in Long's opinion represents a borderline case.

WILCOCKS (1934) made 71 post-mortem examinations in Tanganyika and of these tuberculosis was the cause of death in 11. In 6 miliary tuberculosis was noted, in the remaining 5 little fibrotic change was

seen and the walls of the cavities were necrotic though in 1 case there was evidence that healing had taken place in one of the lesions.

PASTOR and CESTERO (1936) interpreting the X-ray appearances in 1,000 Porto Rican patients with pulmonary tuberculosis maintained that no significant differences could be seen in coloured patients as distinct from White. Of the total 809 were Whites, of Spanish stock, 159 Mulattos and 32 Negroes. The form of the disease was preponderantly fibrocaceous, in 48% exudative infiltration was diagnosed, in 52% fibrous changes were equal to or greater than the exudative changes. Massive tuberculous pneumonia was only recorded once, while military tuberculosis was seen in 5 cases. Cavities were seen in 56%, the most frequent location being in the upper third, next in the middle third and relatively rare in the bases of the lungs. KOPPISCH (1936) who based his findings on 628 autopsies in Porto Rico differed considerably from the above Porto Rican observers in his analysis of the observed changes. He found a number of lesions of the childhood type with wide dissemination and concluded that the Negroes of Porto Rico are less resistant to tuberculosis than the Whites.

Causal Factors in Tuberculosis in the Tropics.

Race.—The marked differences between the mortality rates of various races living in approximately the same environment and under largely similar conditions of climate, work, etc., are recorded by CUMMINS (1923), whose well-known table of figures relative to the different races is reproduced here:—

Annual incidence and mortality from Tuberculosis per 10,000 of average annual strength in seven racial types of British Expeditionary Force, France and Flanders, 1918.

	Cases per 10,000	Deaths per 10,000
British and Dominion Troops	6.056	3.398
Portuguese Troops	33.636	9.242
Chinese Labour Corps	36.355	13.433
Indian Troops	93.464	17.249
Indian Native Labour Corps	142.040	53.384
South African Native Labour Corps (Kaffirs)	290.665	221.923
Cape Colony Labour Corps (Cape Boys) ...	444.115	103.627

Even in temperate climes evidence is not lacking that race may play a part in the onset of the disease. BRADBURY's (1933) investigations in the towns of Jarrow and Blaydon led him to believe that there was evidence of a racial factor responsible in part for the higher incidence amongst the Irish section of the population. There are in existence two schools of thought with regard to the part played by a racial factor in the onset and spread of tuberculosis amongst tropical peoples. One holds that the widespread incidence of disease amongst Africans is due entirely to the absence of prolonged exposure to infection and is further aided by lack of hygienic surroundings. The other asserts that given centuries of exposure and a betterment of environmental conditions there still exists a racial characteristic that favours undue susceptibility to the disease. The term "racial factor" is not always employed accurately and as GUILD (1933) points out, many workers using such a term are not referring to a true genotypic difference.

Rather they have in mind the result of a relatively short period of exposure to infection; this, he states, is not a racial nor biological factor but an historical one. HOEBEKE (1934) is convinced that there is an essential racial difference, the Black makes his tuberculosis a Negro tuberculosis whatever surroundings may be envisaged. What reinforces Hoebeke in this assertion is the fact that the Negro torn away from Africa and transplanted to a strange country after a period of centuries continues to manifest this type of tuberculosis peculiar to his race. In face of this prolonged contact the Negro still remains more sensitive to the disease than the other races dwelling around him. Despite transplantation into alien surroundings over long periods of time the Negro maintains his biological characteristics as we know from SNYDER's (1929) investigations into the blood groups of the Jamaicans. In Jamaica, though crossing with whites has modified the proportion of the blood groups to some extent, the Jamaican Negro, despite generations of existence in a non-African environment shows in his blood grouping definite evidence of his African relationship.

CUMMINS (1934) says the childhood type of tuberculosis seen in the African goes with a fundamental lack of resistance to the disease. He maintains that the African appears to be racially incapable of developing against the European *Myco. tuberculosis* those fibrotic barriers which localize the disease in other races.

SCOTT (1935) does not consider that the theory of virgin soil is a complete answer to the question as to why tuberculosis is so often severe in tropical peoples. He, too, considers that the susceptibility of the African is a racial peculiarity. That other races, apart from the White, do develop a high degree of resistance is seen in HALL and CHANG's (1934) studies of latent tuberculous infection in Chinese adults. They state it appears evident that the Chinese have been exposed to infection since the days of the old Chinese civilization. To-day the disease is of the localized type with no florid excretion of bacilli. Infection is universal and immunity is maintained at a high level by repeated small infections while allergy is not unduly raised.

While we have ample illustration of the susceptibility of one race to tuberculosis, there is not lacking proof that at least one race has a markedly heightened resistance to the disease. ARNOULD (1936), who investigated the incidence of tuberculosis amongst the Jews, quotes the figures for the tuberculosis death rate among the Jewish and non-Jewish populations of Budapest from 1921-1934. In 1921 the rate for the Jews was 19.7 per 10,000, as compared with 43.4 per 10,000 for the non-Jewish sections. Since then the rate for both parties has fallen steadily, but the Jewish rate is still far lower, 10.8 as compared with 19.5 for the non-Jewish population. He describes the conditions in Poland to show that a lower rate is not due to better environment; there the Hebrews are amongst the poorest of the people; despite this, their death rate is low. Arnould believes that the Jews as a race have acquired a special resistance during the fifteen to twenty centuries in which they have been constantly huddled together in urban surroundings.

PUTNAM (1933) comparing the figures of 373 Italian and Hebrew families attending a tuberculosis dispensary, was convinced that the type of disease differed for the two races; among the Italians the disease attacked the younger group and pursued a more severe and rapidly fatal course than was the case with the Jews. On the other

hand, authorities such as BOLTANSKI (1935) do not agree with HOEBEKE; he considers tuberculosis is not a new disease of Africa and may have been present for centuries. The spread of the disease is not due to a special racial difference, but is due to circumstances parallel to those in the U.S.A., where the Negro engaged in agricultural pursuits falls a victim, not necessarily because he is an African, but because he becomes urbanized.

GALLOWAY (1928) made the observation that the heightened susceptibility of certain races domiciled in Malaya follows exposure to urban conditions after centuries of rural life. He places them in the following order as indicating their relative unprotectedness: Malays, Japanese, Agrarian Chinese and some Indian races, especially Sikhs. He crystallizes his views in a terse and significant sentence: "the nearer the land, the more recent their adoption of urban conditions, the more fatal the disease."

MILLS (1935) believes that the basic factor at play is the energy level which, in turn, is definitely dependent on the degree of climatic drive imposed on the population, especially throughout childhood, and that the racial factor is far less significant.

MOON (1928) observed that the average size of the spleen in the adult Negro is much below that of the white race.

This anatomical difference is not the sole one present: in a comparative study of the two races TURNER (1932) in the course of the Witwatersrand investigations compared the physical measurements of South African natives with that of Europeans. He found the African to be inferior in physique and this was especially noticeable in relation to chest measurements, both in size of chest and degree of normal expansion. During the last few years important work has been carried out on a physiological characteristic of certain Oriental races, low vital capacity.

KRISHNAN and VAREED (1932) estimated that in 103 medical students, 18-29 years of age, from the Madras Presidency the vital capacity was only 67% of the average for British and American men of the same height. They hold that this is not a racial characteristic but due to climate, lack of exercise and low metabolism. MASON (1932) in a similar study of the vital capacity of 853 South Indian women, found they averaged 76% of the measurements in American women. She considers this difference is characteristic of many Oriental peoples.

FOSTER and HSIEH (1923) in a small series of 75 Chinese women had obtained figures practically identical to those of MASON for South Indian women. CORDERO and OCAMPO (1931) calculated the vital capacity of 2,600 male University students in the Philippines. Their analysis showed that the average figure for male Filipinos was 2 litres per sq. metre of body surface. This, they pointed out, was equivalent to that of male Chinese but lower than that of American males of a similar class in whom the average was 2.5 litres.

Another factor to be taken into consideration is the influence of cross breeding between races. DAVENPORT and STEGGERDA (1929) carried out extensive researches into the effects of race crossing in Jamaica. They say "when two inbred varieties are crossed, the offspring show unusually rapid growth, attain exceptional size and display high resistance. Such hybrid vigour is ordinarily found in the F. 1 generation (pure White and pure Black), but it may appear in individuals of later generations of panmixia whenever the two causative genes are inbred in the same zygote."

They found no evidence of physical hybrid vigour in the Browns as contrasted with the Blacks and Whites.

The consensus of opinion is that the people of mixed race tend to exhibit clinical and pathological characteristics similar to those of Whites and do not present so markedly lowered a resistance as in the case of the pure bred Negro. HALFORD (1933) commenting on the many racial mixtures met with in Hawaii says that such admixtures do definitely influence the correlation of mortality rates and percentages of tuberculous infection. Pure Hawaiians have a tuberculosis death rate of 310 per 100,000 and a Mantoux positive figure of 75.9%. In Asiatic Hawaiians the corresponding figures are 150 per 100,000 and 70.6%, and in Caucasian Hawaiians 130 per 100,000 and 56.0%.

One should not lose sight of the fact that people of Mixed race tend to break away from the mode of living of their predecessors and this environmental change must play a part in altering their resistance. HRDLICKA (1908) describing the progress of tuberculosis amongst American Indians, noted that the mixed bloods contracted active disease less frequently than the full bloods, he considered it probable that some change in living conditions lessened the spread of infection. CARTER (1920) held that a test of mentality would show a greater difference in favour of the better developed type than any comparison between light coloured Negroes and those of pure descent. In his view the stouter resistance apparently shown by those of Mixed race over the pure African strain was due to racial and cultural development and not to inherited resistance.

Diet.

COBBETT (1930) in his investigations into the increase of tuberculosis mortality during the European war, concluded that the interference with the food supply, especially shortage of fats and consequent lack of fat soluble vitamins, played a large part. Certain animal experiments indicate that there is ground for believing that fat soluble vitamins have some effect in lessening susceptibility to tuberculous disease. SMITH and HENDRICK (1926) carried out experimental tuberculous infection of albino rats and showed that they could be rendered susceptible to tuberculin shock by withholding fat soluble vitamin A. The tubercle infected rats deteriorated more rapidly than the non-infected controls when maintained on a diet of low biological value and low in fat soluble A. A liberal allowance of vitamin A appeared to afford protection against the early deterioration. SCHÜTZE and ZILVA (1927) in their experiments on guineapigs obtained some evidence of the deleterious effect of a restricted diet on the course of tuberculous disease in the guineapig. OTERO *et al* (1934) in experiments on white rats depleted of vitamin A and inoculated with human, bovine and avian tubercle bacilli, noted, on the other hand, that there did not appear to be any lessened degree of resistance. The only positive finding was the appearance of caseation only in those rats completely depleted of vitamin A. Most tropical dietaries have a deficiency of the fat soluble vitamins and not a few are deficient in other necessities. ALLAN (1932) was impressed with the part played by insufficient food in adding to the liability of mine labourers in South Africa to develop clinical tuberculosis. He further observed the tendency for the tuberculosis incidence and mortality to fall when good and sufficient nourishment was available. WILCOCKS (1935) remarks that the caloric value of the native diet in Tanganyika is adequate, but there appears

to be a deficiency of the fat soluble vitamins. GEOGHEGAN (1919) recorded that in the West Indies starchy foods predominate and proteins are limited.

Housing Conditions.—There is now no question that bad housing conditions have a deleterious influence in the spread of tuberculosis. Unfortunately, such conditions are frequently encountered in most tropical countries. OPIE and ISAACS (1930) picture of the housing conditions in Jamaica may be taken as typical of many other areas especially in the West Indies. They are positive that the spread of tuberculosis in Jamaica is increased by the overcrowding in the tenement rooms not only in Kingston but also in the larger towns. PASTOR *et al* (1935) made a survey of two municipal areas in Porto Rico, one was some distance from any large centre, had a cool and pleasant climate and while overcrowding per house was present did not have any marked congestion of buildings. The other, close to a large city, with a hot climate and a large number of buildings huddled together in a constricted area had a higher tuberculosis death rate. They considered that this overcrowding of buildings jammed together on small tracts of land, played a large part in increasing the opportunities for contagion.

The lack of elementary sanitary principles further increases the chances of infection. AUGUSTINE (1929) studying the home conditions in contact families injected dust collected from floors and furniture into guineapigs. Two out of nineteen homes of White, and four out of five homes of Negro, families were positive for the presence of *Myco. tuberculosis*. This danger is accentuated by the habit, so widespread in the tropics, of indiscriminate spitting; MINETT (1930) conducted an investigation over a period of four months in Hong Kong. Specimens of sputum from public places such as markets, stations and streets were examined. In 7% of these, acid fast organisms, morphologically identical with *Myco. tuberculosis*, were detected.

Syphilis.—The widespread incidence of syphilis in many tropical countries often presents a problem to the phthysiologist. Apart from the question of differential diagnosis in the rarer form of syphilis of the lung there is the difficulty of deciding how far to carry out intensive anti-syphilitic treatment in tuberculous subjects. The subject has received considerable attention in the U.S.A. especially in relation to tuberculosis work amongst Negroes. The necessity for this is shown by GUILD and NELSON (1936) who circulated a questionnaire to sixty-seven institutions in the United States involving twenty-five thousand patients. They ascertained that where serological tests were carried out the Wassermann reaction or its equivalent was positive in no less than 21% of Negroes as compared with 4.1% of Whites.

There are some authorities who hold that there is a definite relationship between tuberculosis and syphilis. LANDSBERGER (1923) analysed the post-mortem findings in 5,323 cases in Germany and came to the conclusion that the two diseases do not co-exist more frequently than their individual incidence might explain. On the other hand, GREER (1930), who performed serological tests on 1,994 persons attending a tuberculosis clinic concluded that some relationship did exist since the incidence of syphilis was conspicuously higher in those with tuberculosis than in those without.

Whether it is wiser to concentrate in treating tuberculosis and apply the minimum of treatment for syphilis when both diseases are present, or actively to treat the latter, is a question which deserves serious

consideration. The danger of too thorough anti-syphilitic treatment was emphasized by POTTER (1916) who considered that such treatment should be administered with care. He recommended that small doses of arsenicals should be given for a short course with heavy metals or with rest. SCHLESINGER (1926) enunciated certain guiding principles based on his own wide experience of treatment and these form a valuable aid to those who are called upon to face the problem.

i. Late syphilis clinically quiescent but complicated by recent pulmonary tuberculosis. Treatment should be concerned solely with the lung condition and anti-syphilitic treatment abandoned until definite evidence of cure, or at least marked improvement of the tubercular process obtained: even then arsenical preparations should be avoided and heavy metals employed.

ii. Untreated late syphilis in conjunction with fibroid phthisis. There is less danger of reactivation of the lung condition but only small doses of arsenicals should be given in addition to treatment by heavy metals.

iii. Fibroid phthisis and early syphilis. This depends on the degree of activity of the pulmonary disease, if there is little chance of stirring up trouble then full anti-syphilitic treatment should be undertaken. If cavities are present or any evidence of active disease small doses of arsenicals should be instituted and the thoracic condition carefully watched for a flare up of the old lesions.

iv. Early tuberculosis present with recent syphilis. The prognosis in these cases is unfavourable. Anti-syphilitic treatment takes second place.

BAUER (1934) believes that syphilis takes a modest place as one of the aggravating factors in the causation of pulmonary tuberculosis and that syphilis contracted during an active tuberculous infection does not hinder the cure of the latter. The more syphilis approaches the tertiary stage the less does he fear its effect in tuberculosis. Further, he holds that the correct therapy of syphilis nearly always diminishes the evil effects of tuberculosis.

A recent review of the whole question is furnished by PADGET and MOORE (1936), who, from their experience of the administration of a venereal diseases clinic with 20,000 patients, 70% of them being Negroes, came to the conclusion that there was a connexion between intensive anti-syphilitic treatment with full doses of arsenicals and an acute onset of tuberculosis. They observed 15 cases in whom the sequence of events was strongly suggestive of a flare up of acute tuberculosis with rapid dissemination following a course of arsenical treatment. All of them were Negroes, the majority being women, while 9 of them were under thirty years of age. They do not agree with those workers who hold that active tuberculosis favourably modifies the progress of syphilis, but they are of the opinion that untreated syphilis has a detrimental effect on the course of tuberculosis. As they point out the recent syphilitic must be rendered non-infectious as speedily as possible for the benefit of the community, and treatment has to be undertaken even in a modified form.

Further, it is folly to concentrate wholly on the cure of the lung condition neglecting completely the spirochaetal infection since the end result of untreated syphilis is, too often, death.

Malaria.—The interaction between malaria and tuberculosis has attracted the attention of a number of clinicians and opinions are still divided as to the benefits or otherwise of the co-existence of these two infections. Not only is the subject of clinical interest but it also has a distinctly historical appeal. ADAMS (1849) in a footnote to his translation of the First Book of Epidemics remarks that certain authorities,

particularly of the French School, believed Hippocrates definitely asserted that intermittent fevers superinduced an immunity to phthisis. FREIMAN (1927) while making a study of this problem in Cyprus of inter-relationship of the two diseases tuberculin tested (von Pirquet) 406 persons suffering from acute or chronic malaria. In the acute cases, numbering 136, anergy was present in 91%, hypoergy in the remaining 9%. The duration of this anergic phase varied from 7-40 days. In 272 cases with chronic malaria anergy was present in every one and lasted from 20 to 200 days. He also furnishes clinical examples illustrative of the rapid onset and spread of tuberculosis in the presence of malaria. In confirmation of his views he quotes the opinions of GRACIEUX and ATKEY who maintain, as a result of their extensive clinical and pathological observations in various tropical countries, that malaria forms a good soil for the implantation of tuberculosis and that the simultaneous presence of both diseases in the same subject increases the gravity of the prognosis.

KYRIASIDIS (1930), investigating the subject calculated the opsonic index to *Myco. tuberculosis* in 128 malarial patients and also carried out tuberculin tests (von Pirquet) on 125 adults suffering from malaria. He concluded from the results of these that malaria does not produce conditions favourable for the implantation and spread of tuberculosis. The increase in the opsonins in the serum of these cases of chronic malaria would, he opined, offer a powerful resistance to tuberculous infection. COLLARI (1932) is of the opinion that in a "malarious soil" the *Myco. tuberculosis* develops poorly and its virulence is definitely lessened. On the other hand, he observed that if malarial infection is contracted by a tuberculous subject there is a tendency to a rapid spread of the miliary type. He furnishes (1933) a detailed history of five open cases treated by malarial therapy. The results were bad, 1 dead, 3 worse, and 1 improved. JEMMA (1932) considered that malaria markedly aggravated the course of tuberculosis. In children suffering from malaria he advised a careful watch should be maintained for the onset of acute tuberculosis.

KRISHNAN (1936) records that in a fatal outbreak of spontaneous tuberculosis in laboratory monkeys 14 died, of these 4 had been infected with malaria and 10 were free from any such infection. A comparison of the tuberculous lesions in both groups showed that there was not much difference as regards the type of the disease since the majority of the animals evidenced the changes of acute miliary tuberculosis. In three of the monkeys, however, who had been inoculated with malaria there was distinct proof of fibrosis and calcification in the lungs. These monkeys had through their inoculations acquired a high degree of immunity to malarial superinfection. SCOTT (1930) states that he has never seen fibroid phthisis or healed tuberculosis in monkeys. KRISHNAN infers from this that the fibrosis and calcification may well be attributed to the influence of this acquired immunity to malaria. HODSON (1929) could not find any real association between the two diseases.

Helminthic infection.—In all cases of tropical disease anthelmintic treatment is so much a matter of routine and its benefits so clearly indicated that observations such as those of Mandoul require careful consideration.

MANDOUL (1931) reviewing his work in the early years of this century recapitulated the fact that his experiments on the guineapig indicated that a retardation of the tuberculous process occurred when

the animal had been infected with *Taenia discursis*. He quotes SOROUR's (1930) observations in Egypt where he had found marked fibrosis around, and definite encapsulation of, tuberculous lesions in the lung when bilharzia was also present in the same subject. Similarly, he considers that the rarity of genito-urinary tuberculosis in that country may be due to the existence of bilharzial lesions in the urinary tract.

SOROUR considers there is a possibility that helminths, especially schistosomes and ankylostomes, with their accompanying intense eosinophilia render the soil less favourable for the development of tuberculosis and MANDOUK agrees with this view.

VON BÜLOW's (1929) case of a young man in Costa Rica, in whose sputum were found larvae of *Ancylostoma duodenale* and scanty acid fast bacilli, points to the possibility of the hookworm directly influencing the course of the tuberculous invasion. X-ray examination of the patient revealed opacities at both apices with some decrease of translucency in the lower portion of the right upper lobe. After treatment with oil of chenopodium the conditions cleared up entirely in the lungs. von Bülow holds that there was a re-activation of a latent tuberculous infection due to the passage of larvae through the lungs. BERNY (1936) found that ankylostomiasis and pulmonary tuberculosis were not infrequently encountered in the same subject in French Guiana.

Of 30 open cases of tuberculosis, 13 were infested with worms, in 11 of these hookworm was present. He followed the course of the disease, investigated the degree of infestation, the eosinophil count and the effect of disinfestation and concluded that tuberculosis ran a similar course in those who were parasitized as well as in those who were free.

Treatment by Collapse Therapy.

Artificial Pneumothorax.—While the usual preventive measures have been advocated in most tropical countries it is only recently that the advantages of surgical treatment have been considered as possible of application outside the temperate climes. There are still vast areas where the native population is denied the advantages of any form of collapse therapy. Such a state of affairs is due partly to the great difficulty experienced in persuading the inhabitants to undergo the long period of detention required, in part to the lack of sufficient medical officers with time enough at their disposal to carry out the necessary measures. Moreover, while there are medical administrators eager to institute modern therapeutic measures they are deterred by the fact that knowledge of the efficacy of such treatment in coloured people is, to a great extent, lacking.

On this point a certain amount of information may be culled from a study of results of collapse therapy amongst Negroes in the U.S.A. There we have at our disposal the accumulated knowledge of skilled workers who are treating a coloured population with an apparent lack of resistance to tuberculosis.

CHADWICK *et al* (1933) comment on the widespread opinion in the U.S.A. that tuberculosis is so prevalent amongst Negroes and so unresponsive to routine treatment that it is useless to do more than keep them in bed as the disease progresses in face of all efforts. This has not been their experience for between January 1931 and September 1932, 263 male and 201 female Negroes with pulmonary

tuberculosis from 5-65 years of age were hospitalized and given artificial pneumothorax treatment. There were 10% in the minimal stage, 23% moderately advanced, and 67% far advanced. Of these 58% died, 28% apparently arrested, 5% improved and 9% not improved. They believe prompt collapse therapy is indicated in the Negro since it definitely prevents spread of the disease and reduces toxæmia. They also express the view that in the Negro the lack of fibrous tissue formation results in a lessening of pleural adhesions and adhesive pleuritis as that complete collapse is more often obtained than is the case with the Whites.

BROCK (1933) compared the treatment of a group of 36 Negroes, all with advanced disease, with that of a group of 161 Whites. In both groups cavities were present, in all but 3 of the Negroes and 7 of the Whites. 21 Negro patients died in the first twelve months of treatment; 8 of these deaths occurred in patients with one lung affected. Satisfactory collapse was obtained in six of these unilateral cases yet spread to the contralateral lung took place when the collapse had been maintained for some time. Only one of the 36 patients is at work, and she is a nurse, two with bilateral and seven with unilateral disease were improved. The results among the white patients were much better. His experience has been that in several so-called unilateral cases with good collapse, evidence of commencing exudative lesions in the contralateral lung soon became apparent. While BROCK's experience is contrary to that of CHADWICK, it is to be noted that all his cases were advanced. Those who have carried out similar measures would be very chary of recommending active intervention at an advanced stage in coloured peoples, except for the relief of symptoms.

GAINES and KELLER (1933) from their limited experience of artificial pneumothorax in a small group of 7 Negroes stated that such a procedure in the Negro is fraught with peril. Complications occur with greater frequency and are more serious than in other races. However, they aver that while results in collapse therapy in the case of the Negro vary considerably they approximate sufficiently closely to those obtained in white people to justify the labour and time expended. The difficulties are enumerated, namely, the Negro's dislike of hospitals, the difficulty of obtaining regular refills due partly to aversion to the needle, partly to distance to treatment centres. BROWN and SAMPSON (1935), consider that in the age period when exudative lesions are predominant, that is, between the ages of 12-19 years, A.P. is the treatment of choice. They also recommend that all Negroes, irrespective of age, should be placed in this group.

A problem that is continually present in connexion with A.P. treatment is the provision of an adequate number of beds. In recent years efforts have been made to limit the time spent in bed and to extend facilities for ambulatory treatment. The results of such ambulatory treatment are sufficiently satisfactory to justify its adoption wherever the question of obtaining hospital accommodation raised difficulties.

In Germany, KOGAN (1930) treated 33 cases by A.P. without placing them in hospital and found the results were as good as among those who had had the benefit of sanatorium treatment. MYERS and LEVINE (1935) found that with progressive lesions, minimal in extent, and even in those with more advanced lesions, A.P. treatment was markedly successful with only a short period of bed rest at home or at hospital during induction. Furthermore, some who refuse hospitalization will

submit to an A.P. provided they may continue their activities. Of a group of 52 white patients, mainly adults and adolescents, most of whom had had no bed rest or only a few weeks, 4 died, and 42 are working, or are fit for work.

CUTLER *et al* (1934) set up a clinic in 1931 for the treatment of Negroes with A.P. They were forced, in face of a shortage of beds, to institute an ambulatory form of attention. A short period of hospitalization at the time of induction, about one week, was followed by sending the patient home. Once at home he was instructed to remain in bed between visits to the clinic for refills and gradually permitted to increase the time spent out of bed as improvement was noted. The advantages of this treatment from the administrative viewpoint were marked, a far greater turnover of patients per bed being thus obtained. Thirty-seven adult Negroes were treated and at the time of writing 16 of these were either working or improved, all had negative sputum. They consider that their results justify a much wider extension of these methods.

As far as the tropics are concerned no large series of figures for this form of treatment are available. BLANCHARD (1935) in French West Africa performed A.P. on 52 out of 356 tuberculous cases in a space of four years. Of these 32 had extensive lesions of the fibrocaceous type with haemoptyses. Of this series 3 were in an early stage, 7 moderately advanced and 42 advanced, 47 were unilateral and 5 bilateral.

Only once was bilateral collapse induced and that because of severe haemoptysis, in this case life was prolonged for two years. Unfortunately the immediate results were so good that 48 left hospital after a dozen or so refills, confident that they were well on the road to recovery and were not traced. Of the 4 who remained, it was impossible to give a definite prognosis but both clinical and X-ray evidence point to the probability of ultimate cure. STONES (1928) demonstrates the difficulties met with when A.P. is attempted amongst the more backward races in East Africa. He states that some were too frightened or too mystified by the idea of the treatment and that it was rare to encounter a patient in a sufficiently early stage to benefit by the procedure. HEIMANN (1936), who has attempted A.P. treatment among the South African natives found that after the induction and one or two refills they left precipitately and he has given up all attempts to continue with it. CUMMINS (1932) believes, however, that some of the natives have reached a stage where their resistance is sufficiently high to benefit from modern treatment. It might be argued, he adds, that they were unwilling to undergo sanatorium treatment but the increased number who yearly seek hospital treatment indicates the growing confidence of the natives in European methods.

WILCOCKS (1932) reports promising results from A.P. treatment in Tanganyika. He maintains while it has the disadvantages of prolonged treatment it is a simple procedure which can be done on out-patients. In 1934 he again reports encouraging results from this form of treatment. PAI (1927) reviews the results of A.P. treatment of 93 patients in India. These were all moderately or far advanced, in 22% the disease was arrested as compared with 14% in 344 patients receiving routine treatment only. In 53% of A.P. cases the sputum became negative as compared with 17.7% in the ordinary group.

In the Dutch East Indies anti-tuberculosis measures are well in advance of most tropical countries, yet PANETH (1932) complains that

collapse therapy is not sufficiently practised there. He has obtained satisfactory results in members of all races domiciled there.

Phrenic Evulsion.—In the more remote areas and amongst primitive peoples averse to prolonged attendance at a hospital, phrenic evulsion must be the operation of choice. It has certain advantages, simple to perform, complications are unusual and there is no prolonged after treatment. Originally recommended as a procedure for basal lesions, its scope has been widened in more recent times and a perusal of published reports of its use in temperate and tropical areas furnishes us with an idea of its scope and its limitations. WOLF (1928) reported 18 cases operated on in France, all with cavities in the upper lobe, of these 5 were completely cured despite the fact that in them the cavities were large and had resisted treatment for over a year. They disappeared in eight to twelve months after the operation. In 9 cases, recently operated on—oldest only six months previously—a definite amelioration of symptoms was noted, sputum was less in quantity, fever subsided and the sputum became negative, while there was a partial regression of the lesions. In four cases there was no improvement, since large cavities were present, kept open by adhesions. MATZ (1936), in the U.S.A., employed phrenic therapy for 233 out of 320 tuberculous patients, of these 301 were far advanced. He reports good results in overcoming symptoms including a favourable effect on haemoptysis. For the period under review, ranging from five months to six years, 63 were alive (27%); of these 35 were much improved or improved, 18 were unchanged and 10 worse. There was a diminution in size or actual disappearance of cavities in 25 of 48 patients. GAINES and KELLER (1933) performed phrenicectomy in 25 cases of pulmonary tuberculosis in American Negroes, 6 were moderately and 19 far advanced. The results were encouraging, since 44% showed definite improvement.

FRIMODT-MÖLLER and GNANAMUTHU (1930) record good results by phrenic exairesis as a supplement to A.P. treatment in India. Marked improvement was obtained in about half the number of cases when this procedure was followed: of 36 patients, 15 were much improved and 11 improved. In 55 cases it was the sole operation and of these 19 were much improved and 12 improved. Unfortunately the time elapsing between the operation and the publication of the results is not given. The authors point out its use in India, where it is difficult for patients to continue A.P. treatment after they leave the sanatorium owing to the paucity of centres where refills might be obtained.

O'SHAUGHNESSY (1932) working at an out-station in the Sudan and unable to perform A.P. for lack of X-ray apparatus, performed phrenic evulsion in 53 cases. Of these only 32 were finally traced, 3 cured, 9 improved, 7 worse and 13 dead. No attempt was made to select cases as even in the worst examples symptomatic relief was the object of the operation. He considers that, on the whole, results were not encouraging as only three cures could be recorded, and he feared that even in these relapse might occur in the course of time. However, in the improved group there was evidence that some might ultimately obtain arrest of the disease. One or two of the results, he says, were exceptionally good and several cases were restored to normal health for a year or two before their final collapse. In many cases there was improvement of symptoms such as intractable cough.

VAN GOOR (1932), reported that he had performed hemi-paralysis of the diaphragm in 46 cases in the Dutch East Indies, 3 by alcohol

injections and the remainder by phrenic evulsion. The period under review was less than three months with respect to 16 of the operations and he excluded them from his results. Of the remaining 30, no clinical or radiological improvement was seen in 8. In 13 of the 22 improved cases the sputum became negative and the pulmonary lesions cleared up. He maintains that this is the best form of collapse therapy for general use in the Dutch East Indies.

LEO and CHANG (1934) reviewing 41 cases in China, estimated that 68% benefited as far as the immediate results are concerned and that in 32% there was no effect or the results were adverse. The authors recommend that phrenic exaeresis should be extensively employed in China, where the majority of the sufferers belong to the poor and ignorant class for whom the application of A.P. while advisable, is completely impracticable. They consider that the results tend to confirm the accepted view that the operation is most beneficial in lesions which are predominantly chronic, proliferative and unilateral. Their results have been quoted, despite the geographical differences, to emphasize the view that the operation can benefit those who stand in greatest need of help, namely, the poverty stricken and uneducated classes. BLANCHARD (1935) gives an account of 31 phrenicectomies performed in French West Africa, mostly in patients with the fibro-caseous type of disease, bilateral and with cavities. They were undertaken in those cases in whom A.P. had failed because of adhesions. Immediate results were good, after a period of *dyspnoea* the general condition improved, weight increased and sputum lessened, though clinically and radiologically the lung condition was stationary. In only three cases were physical signs and X-ray appearances sufficiently good to allow a resumption of work. BLANCHARD points out that in France the results of phrenic evulsion are 10-13% of cures after a long period of observation and that his own results are therefore not unfavourable.

Oleo thorax.—This method of treatment has received very little attention in the tropics. SHRIKHANDE (1934) reports 6 cases treated at the King Edward VII Sanatorium in the United Provinces. Of these, 3 are probably dead, 1 has lived for over three years, the other 2 for over one year. He considers the procedure a useful adjunct in the treatment of purulent effusions following A.P. WISSE (1934) stresses the advantages of oleo thorax in a tropical community such as is met with in the Dutch East Indies where the difficulties of maintaining artificial pneumothorax treatment are manifold. He furnishes full details of his technique and notes excellent progress in two cases.

Thoracoplasty.—It is only natural to expect a paucity of records concerning this severe operation when so few results of the simple process of ordinary collapse therapy are available. Too few findings have been published to enable one to judge of the efficacy of this mode of treatment in the tropics.

Aurotherapy.—The employment of gold salts has not been extensive largely on account of the expense of the preparation. BROCK (1931) in the U.S.A. treated a group of 17 Negroes and 29 Whites with gold salts. All the white patients did well but the results in the coloured group were disappointing. Some arrest of the disease was observed on physical examination and on an estimate of the general condition, but this was not verified by X-rays, for the roentgenograms showed no regression of the lesions. ROY *et al* (1933) treated, in India, a total of

42 patients by gold salts, some of them also received A.P. They report good results in early cases but little effect in others.

BENJAMIN (1934) reports the treatment since 1925 of 440 inmates of the Union Mission Tuberculosis Sanatorium, South India, with Sanocrysin. He encountered severe albuminuria in 3 cases, severe dermatitis in a similar number, chrysiasis in 2 and stomatitis of a severe nature in 4. He considers when sanocrysin or other gold salt preparation is combined with collapse therapy in disease of contralateral lung the progress is improved. BLANCHARD (1935) has also employed the drug in French West Africa but found large doses to be dangerous and recommends the trial of small doses intramuscularly or intravenously, 0.05 gm. to 0.25 gm. twice weekly for a total of 3.0 to 4.0 gm. In 57 cases, of whom 44 were in hospital and 13 ambulatory, 17 had albuminuria and 2 severe dermatitis as a result of aurotherapy.

Sodium Morrhuate.—The success with which another disease, namely leprosy, has been treated by morrhuate preparations, induced workers to consider the possibility of employing the same preparations in tuberculosis. DAVIES (1921), recommends its use in India and quotes one case in which marked improvement was obtained after a long course of treatment with sodium morrhuate. ANDRÉ and LABERNADIE (1933) employed the oil of *Hydnocarpus wightiana* extensively in the treatment of pulmonary tuberculosis. They consider that improvement took place but furnish insufficient evidence to justify their contention. However, the authoritative pronouncement of CROCKET (1926), who used sodium morrhuate and ethyl morrhuate over long periods of time and on a large number of patients shows that their employment is not only useless but also may be harmful.

Solar therapy.—There are some workers who contend that with an abundant and constant supply of sunlight efforts should be made to take advantage of it. PRINGLE (1930) voices the opinion of most phthisiologists with tropical experience when he says the sun in South Africa is probably the most dangerous therapeutic remedy one can use unless it is supervised with very strict discipline. CROCKET (1926) pointing out that sunlight has no immunizing effect on those who have not become tuberculized considers that exposure to the sun should never be recommended in a careless fashion but always under medical supervision. He finds it most advantageous in the fibroid type of disease.

Climate.—ROGERS (1925) is the only worker who has thoroughly investigated the influence of climate in the tropics on tuberculosis. In his study of the incidence of tuberculosis in India in relation to the meteorological data, he found a high tuberculosis rate coincident with a high rainfall and humidity. The direction, steadiness and strength of the rain-bearing winds appear to be the most important factors in addition to high rain-fall and absolute humidity. It is of interest that his findings for pneumonia were diametrically opposite to those in connexion with tuberculosis. Many medical men in the tropics consider that the chances of recovery for the tuberculous patient in a warm climate are poor. While the chances of benefiting from residence in dry, cool climate may be more favourable there are other factors to be considered.

KNOPF (1931) maintains there is no specific climate for tuberculosis and that if one has to choose between having a patient under special medical supervision with mental and physical rest in his home climate

or sending him even to an "ideal" climate where he would be in strange surroundings and do as he pleased, it is preferable not to advise a change.

Tuberculosis in Children in the Tropics.

The subject of pulmonary tuberculosis in children in the tropics has received scant attention. To obtain any information on this point we have to turn to the work of investigators in the U.S.A. in relation to the Negro child.

OPIE (1924) came to the conclusion that the high mortality from tuberculosis in the Negro race and the prevalence of the acute forms of the disease are best explained by partial lack of immunization. This theory was widely taken up for a time but following further investigations, he and his co-workers, HETHERINGTON *et al* (1929) revised this opinion, since the results of large scale investigations showed that Negro children were even more heavily infected than children of other races. This was verified by ARONSON (1931) who tested a large number of school children in Tennessee by the intradermal method and found that a greater percentage of coloured than white children reacted positively. DROLET (1934) similarly found a greater number of positive reactors among the coloured children in New York as compared with the white races.

McPHEDRAN and OPIE (1933) watched the course of latent tuberculous infiltration of the lungs for a number of years in white and coloured children. Clinically manifest tuberculosis took longer to appear in the case of white children and in all had a favourable termination. In the Negro child such latent lesions developed more quickly into the clinically manifest disease and the outcome was much less favourable, either death ensued or the disease ran a long course. GIBSON (1934) painted a very gloomy picture of the re-infected Negro child. He stated that in his experience children of the Negro race admitted to the sanatorium with an adult type of phthisis of any greater extent than minimal almost invariably failed to recover. Further, that no child with a positive sputum ever recovered, a fatal termination being inevitable. This compares unfavourably with investigations in England, where COCHRANE (1935) in an analysis of 710 children aged 3-15 years, all with open pulmonary tuberculosis, found that the disease was fatal in 74 per cent. of girls and 72% of boys. DONNALLY (1935) is of the opinion that first infections in coloured children are as satisfactorily overcome as in the case of white children.

Epituberculosis.—The writer's experience in England and the tropics leads him to consider that the pathological state known as epituberculosis is more common in the latter region. While holding a resident post in a hospital in England he examined some hundreds of children suffering from benign and malignant forms of pulmonary tuberculosis and did not encounter a single case in which a definite diagnosis of epituberculosis could be made. On the other hand in the tropics in only a small group of children, three typical cases were seen.

Epituberculosis was first described as a clinical entity by ELIASBERG and NEULAND (1920). They noted that in young children reacting positively to the tuberculin test certain of them exhibited a clinical picture with distinct characteristics. On examination of the chest an impaired percussion note was present, usually in the upper part of one or other lung, generally the right. On auscultation a diminution of breath sounds or definite tubular breathing was detected; rarely there

were a few superadded adventitious sounds. The onset was subacute, the child's general condition was either very slightly or not at all impaired. Some cough was usually present, but this did not form a prominent symptom. The striking aspect of these cases was the healthy condition of the children despite the presence of extensive and prominent physical findings. On radiographic examination a heavy, homogeneous shadow was detected filling the whole or part of the upper lobe, usually the limits of this opacity were sharply marked off from the rest of the lung shadow. The condition remained stationary for a period varying from weeks to months and then gradually disappeared with lessening of the physical signs and progressive diminution of the shadow on serial film examination. A differential diagnosis between it and tuberculous pneumonia is arrived at by lack of an acute onset, no marked pyrexia and the absence of the swiftly fatal termination characteristic of the latter type. From chronic non-tuberculous pneumonia it is differentiated by the absence of a history of measles, influenza or other respiratory ailment: further, there are no signs of the severe constitutional disturbances and localization of physical changes of a fibroid nature at the bases of the lungs.

The benign nature of the disease, fortunately, renders post-mortems unusual, but EPSTEIN (1922) reported one such autopsy. Here a large caseous primary focus was seen in the upper part of an upper lobe, it was encircled by a number of tiny tubercles. The remainder of the lobe was atelectatic. GOLDBERG and GASUL (1930) reported the occurrence of this condition in ten children aged 2-9 years in a follow-up of 500 tuberculosis contacts and their controls. Of these 10 cases, 7 were in coloured and 3 in white children; 3 of them had been in contact with open cases of tuberculosis, 7 had no such history. They were all positive to tuberculin tests and in all the general condition was good, the only constitutional disturbance was a slight degree of fever observed in some of them. There was the usual involvement of one lobe, most often the right upper, physical and radiological signs cleared up gradually, leaving in some no trace, in others areas of calcification.

SPENCE (1932) furnished an account of three cases of infants exhibiting the characteristic physical and radiological appearances. Two had a history of contact, the third had a doubtful history, a sibling having died from meningitis which may possibly have been tuberculous. In each case a favourable course was run with little disturbance of the general condition, apart from some pallor and loss of weight in the early stages. The point of interest in these cases was the performance of an exploratory thoracic puncture in one instance and the withdrawal of a small amount of caseous material. This, on examination, proved both microscopically and by animal experiment to contain *Myco. tuberculosis*.

REICHLE (1933) argues that information concerning the histological appearance of resolving tuberculosis in childhood is scanty. He states that there is little doubt that a certain number of so-called epituberculosis cases are simply tuberculous pneumonia. In some, atelectasis has occurred, but the majority are directly the outcome of infection by *Myco. tuberculosis*, i.e., retrogressive tuberculous pneumonia. This applies especially to the cases that remain for a considerable time in a stationary phase before resolution. He maintains since resolution is possible in almost any form of tuberculous inflammation, that it is

superfluous to designate any unusual forms of change by a special term.

MORLOCK and PINCHIN's (1933) account of a case of epituberculosis in a boy of fourteen years of age added considerably to our knowledge of the pathological condition underlying some, at least, of these cases. Roentgenologically the picture was typical of epituberculosis. On bronchoscopic examination a tumour was observed pressing upon the lumen of the upper bronchus of the superior right lobe and a section of this on histological examination showed the presence of lymphatic tissue. Four days later another skiagram showed resolution of the shadow and re-expansion of the lung. They considered epituberculosis was not a pathological entity but merely due to pressure and resultant atelectasis owing to enlargement of root glands obstructing a bronchus. PROSOROFF (1929) examining the radiological appearances of epituberculosis and comparing them with those seen in atelectasis in adults due to thoracic tumours, found a very marked resemblance existed between both those conditions. PARSONS (1934) states that not until the tissues have been rendered allergic does epituberculosis occur. His experience would lead him to consider epituberculosis as a benign form of tuberculosis and not a specific allergic reaction.

In a comprehensive view of the literature, DE BRUIN (1936) defines epituberculosis as a clinical hypothesis used to explain the existence of extensive tuberculous changes which cause no permanent damage in contradistinction to the hitherto accepted bad prognosis of extensive tuberculosis in children. He considers that in many cases the root cause of the changes is the collapse of portion of the lung due to obstruction of a large bronchus. He gives examples of skiagrams in children showing—

(a) the similarity in appearance between epituberculosis and atelectasis ;

(b) displacement of the heart towards the involved side ;

(c) displacement of heart following an increase in the physical signs and X-ray appearance ;

(d) the decrease of physical signs and X-ray shadow and simultaneous return of the heart to the normal position.

An account of a post-mortem is furnished in the case of an infant of three months where the shadow appeared and disappeared only to recur again when the disease was activated by chicken-pox. Death ultimately took place from tuberculous meningitis and at autopsy it was seen that a primary focus had invaded the main bronchus with obstruction and collapse of the corresponding area of the lung. He believes that it is possible to have, in addition to atelectatic changes, definite tuberculous infiltration. He furnishes three pathological explanations of the changes seen :—

- i. Atelectasis.
- ii. Infiltration of specific tuberculous tissue.
- iii. Perifocal reaction around a tuberculous focus.

Non-Pulmonary Tuberculosis.

It is now well recognized that surgical tuberculosis does occur outside the temperate zones though to a very much lesser extent. WIEBERDINK (1920), studying the question in Batavia, gathered data from the city hospital of 42 cases amongst natives of surgical tuberculosis, of these 16 were glandular. Even in remote areas it is not

unknown, as instanced by FERGUSON's (1927) statement that during his travels through the bush in West Africa he frequently observed Africans with tuberculosis of the spine. SMITH (1930) comments on the occasional occurrence of facial tuberculosis in Nigeria and quotes illustrative cases. RABELLO (1932) has rarely seen cutaneous tuberculosis in the equatorial regions of South America, but remarks that it occurs more frequently as one goes south. The lessened incidence of surgical tuberculosis appears to be due to climatic factors, quite apart from the rarity of bovine tuberculosis in many tropical and sub-tropical countries.

GEAR (1935) in a survey of hospital patients listed the lower incidence of non-respiratory tuberculosis in South China as compared with North China. MONTEL (1924) remarked on the rarity of joint and skin tuberculosis in Cochin China but found the Annamites just as liable as Europeans to contract extra pulmonary tuberculosis when they went to the colder climate of Europe. The only case of lupus he encountered in the eighteen years' practice in Cochin China was in an Annamite who had just returned from a three years' stay in France. He considers that the increased amount of sunlight plays a part.

Bovine Tuberculosis.

The view hitherto widely held that bovine tuberculosis is unknown in the tropics is rapidly undergoing modification. From many areas publications on the question have shown that while the disease is uncommon, it is by no means non-existent and is becoming a problem in a few countries. A number of experiments and observations carried out on indigenous cattle, show that these have a certain resistance to *Myco. tuberculosis*; this is particularly the case with the Zebu cattle, which are to be found in many parts of the tropics. LISTON and SOPARKAR (1917), in the course of their experiments inoculated Indian calves, buffalo and cow, with 50 mgm. of a culture of bovine *Myco. tuberculosis*. At least 50% of the calves lived for many days, and when killed, showed tuberculous lesions that were either healed or definitely retreating. They held that it confirmed the general experience that Indian cattle are less commonly affected by tuberculosis. Further, the result lends support to the opinion that the rare appearance of the disease among cattle in India may be ascribed to a natural resistance rather than to any difference in the methods of tending or housing cattle as compared with similar procedures in Great Britain. In certain regions, however, bovine tuberculosis has spread widely, as is shown by LEGENDRE's (1922) account of the disease in Madagascar. The infection was formerly confined to the southern portion of the island but during recent years has extended northwards. He complains that veterinary prophylaxis against tuberculosis in the tropics is even more neglected than human prophylaxis. PAWAN (1927) in Trinidad tested 75 head of cattle, type not stated, by the ophthalmic tuberculin test and found that as many as 13.3% were positive and post-mortem examination confirmed the presence of tuberculosis. He has never found the bovine type of bacillus in any human case in Trinidad. MANLEY (1929) draws attention to the danger of indigenous cattle being infected by the importation of tainted animals from other countries. On a stock farm in the Cameroons he found practically 50% reactors in one herd, nearly all cross-bred cattle which were kept under extremely good hygienic conditions.

He traced the source of the infection back several years to pure-bred cattle imported from Germany. He asserts that bovine tuberculosis can infect cattle in the tropics to a severe degree even when kept in an hygienic manner, and that no animals should be imported into the tropics unless they have previously passed a rigorous test. PURCHASE (1929) came across a similar state of affairs when tuberculin testing a herd in N. Rhodesia composed chiefly of local cattle crossed with Hereford and Shorthorn bulls, of 222 beasts, 45 (10%) were positive. He suggests that native cattle are more susceptible to the relatively newly introduced disease. HALL (1931) reports the occurrence of tuberculosis in a native ox in Nigeria, none had hitherto been reported in the indigenous cattle. The results of the guineapig and rabbit inoculations and the type of lesions produced pointed to the organism being of the bovine type. HORNBY (1934) from his experience affirms that tuberculosis is an unimportant cause of death in cattle in Central Africa. However, he quotes CURASSON's opinion that in French West Africa bovine tuberculosis occurred more frequently than had been suspected hitherto. He also is of the opinion that the native races of cattle, and particularly the Zebu strain, are more resistant to infection than European cattle. He maintains that the fact of such cattle being largely kept out in the open air is one of the deciding factors in this freedom from infection. CORNELL (1934) gives an interesting account of the manner in which the people of the Wachagga tribe in Tanganyika tend their cattle, also of the Zebu strain. These beasts throughout their life are kept in the huts of their owners, tied by the neck to a stall and fed with hand-cut fodder. The huts shelter both humans and cattle under the same roof and there is no partition between the animals and their owners. He tested 156 animals kept in huts belonging to native families of which one member had been found to be suffering from open tuberculosis. These cattle were tested by the double intradermal test and only two (1.5%) reacted positively. So far SOPARKAR (1929) has been the only observer to record in India a case of tuberculosis in a human being in which the causative organism was of the bovine type. The material from which the *Myco. tuberculosis* was isolated consisted of caseating cervical glands; unfortunately no clinical history was available. The possibility that the bovine strain of *Myco. tuberculosis* plays a part in tuberculosis of the respiratory tract in the tropics has, hitherto, been considered unlikely. The information recently available from Uganda (1935) that at the Veterinary Laboratory, Entebbe, 141 strains of *Myco. tuberculosis* were typed from cases of phthisis and in 4 of these (3 adults and 1 child) the bovine strain of bacilli was found, will cause a revision of opinion on the non-importance of other than human strains.

MALARIA.

CHRISTOPHERS (S. R.), SINTON (J. A.) & COVELL (G.). **How to do a Malaria Survey.** Third Edition. Revised by J. A. SINTON.—*Health Bull. No. 14. Malaria Bureau No. 6.* pp. viii+206. With 11 plates & 3 text figs. 1936. Delhi: Manager of Publications. [Rs. 1-8 or 2s. 6d.]

The first two editions of this practical manual [reviewed in this *Bulletin*, 1929, Vol. 26, p. 360; 1934, Vol. 31, p. 517] are well known to a large number of malaria research workers and the appearance of a third edition, in which a number of new facts have been incorporated, is assured of the welcome it merits. Like its predecessors it is designed especially for the use of students in malariology in India. An appendix of 14 pages supplies useful information regarding the registration and compilation of vital statistics in the different provinces of British India, information not readily accessible elsewhere. Another appendix gives a list of 52 Indian Anopheles, noting the distribution, the breeding places, and the importance with regard to malaria, of each. But the greater part of the manual is of much more than local interest and importance, and students in all countries will find it of value as a guide to the elucidation of their malaria problems.

The number of factors that determine, or that may influence, the prevalence of malaria in any locality, is very large, and their interplay may be exceedingly complex. Recent additions to knowledge have thrown light on many epidemiological problems of malaria hitherto obscure, but they have complicated, rather than simplified, the carrying out of a complete malaria survey. That the authors of this manual have been able within 200 pages to condense, not only a consideration of all the more important factors influencing malaria prevalence, but also very concise instruction as to how their relative importance may be estimated, in any given locality, is a great achievement. Detailed instructions and information in all sections, are given with a clarity and absence of ambiguity that are praiseworthy. All technique and methods of investigation recommended have stood the test of prolonged practical experience in this special field of research. As a text-book for students attending practical malariology classes it can be highly commended.

Norman White.

COVELL (G.). **A Note on the Method used to combat Rural Malaria in India.**—*League of Nations. Health Organisation. Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene. Preparatory Papers relating to British India.* Ser. L.o.N.P. 1937. III. 6. pp. 70-81.

This volume is of very considerable interest and importance for it contains, within its 414 pages, all available information concerning the organization for the protection of the public health and for the medical relief of the rural population of all the provinces of British India and of three Indian States as well. This information is not readily accessible elsewhere. The chapter dealing with malaria control in rural areas, which is under consideration here, is not a record of progress. The author starts with the assertion that no satisfactory general method of bringing malaria under rapid and effective control in rural

areas, at a cost within the means of the people, has been evolved in any malarious country in the world. India is no exception. Future efforts will be directed towards a search for cheap, naturalistic, automatic methods of mosquito control, such as "herbage cover" or "sluicing." In the meantime, the efforts of nearly all provincial health departments are concentrated on popularizing the use of cinchona preparations by persistent propaganda and on making supplies of anti-malarial drugs available to those in need of them. Quinine treatments are sold in post-offices and elsewhere below cost price in many provinces and large quantities are distributed free in certain areas. Attempts at more radical control of malaria have been made from time to time in demonstration areas but these can hardly be said to have had any effect on the health of India's rural population as a whole. Eighty-nine per cent. of India's vast population is rural.

N. W.

WHITE (R. Senior). **The *Anopheles sundaicus* Invasion of Lower Bengal.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 307-312. With 1 map.

Bengal is at the extreme north-west corner of the area of distribution of *A. sundaicus*. The story told in this paper of its invasion of Lower Bengal is of unusual interest and of public health importance. As the author remarks: "It is seldom that science has an opportunity of studying an extension of its geographical range by any animal." *A. sundaicus* has long been known to occur in the Sunderbans; in 1930 it was found to be responsible for a severe outbreak of malaria at Budge Budge, sixteen miles below Calcutta on the Hooghly. Since then its range has extended considerably. The number of breeding places actually within Calcutta Corporation limits was only three in March 1934. A year later the number had increased to 36. A severe outbreak of malaria was caused by *sundaicus* in the autumn of 1936 in eastern Calcutta. *A. sundaicus* is a good traveller; it has been frequently found in trains but displays a preference for boat travel. Boats have been chiefly responsible for this extension of its geographical distribution. As it has advanced the species has shown an increasing adaptability to breeding places of lower and lower salinity. Practically all the standing waters round Calcutta are potential breeding places. The death of the Bidyadhari River by silting, caused by bunds for fish culture and for reclamation for rice cultivation and by Calcutta's sewage outfall, has been, in the opinion of the author, an important factor in making a large part of the area suitable for *A. sundaicus*. If this be so, *sundaicus* malaria here is another example of "man-made malaria." This, however, does not apply to the whole of the *sundaicus* invaded area. Another factor of importance in causing the extension was thought by COVELL to be the extensive clearance of mangrove in the Sunderbans, in the years prior to 1930, leading to increased breeding of *sundaicus* in the original focus. The author considers that only a comprehensive irrigation and land reclamation scheme holds out any hope of eradicating or even controlling breeding. He recommends the creation of a Commission of all departments of Government concerned, public health, irrigation, agriculture and lands, to formulate a concerted scheme.

N. W.

PISTONI (Ferruccio). Contributo allo studio dell'immunità per la malaria dell'indigeno Eritreo abitante in località notoriamente malariche. [**Study of Malaria Immunity in a Native Population of Notoriously Malarial Districts of Eritrea.**—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Mar. Vol. 18. No. 3. pp. 138-146. [10 refs.]

The observations recorded were made in two notoriously malarial places in Eritrea, Ghinda and Mansura. Parasite indexes of the adult population were lower than those of children and the number of parasites fewer; this is evidence of an acquired immunity. The immunity to *vivax* infections is more durable than the immunity to *falciparum* infections, which never attains the stage of absolute immunity. Children from one to three years of age harbour larger numbers of schizonts of *vivax* than of *falciparum*. In these areas *vivax* malaria is a disease of early infancy. N. W.

GUIDETTI (Carlo). Progetto di bonifica antimalarica per il territorio del Basso Giuba. [**Antimalaria Measures in the Lower Giuba Territory.**—*Riforma Med.* 1937. Apr. 3. Vol. 53. No. 14. pp. 497-498, 501. [16 refs.]

In continuation of an article which appeared last year in *La Riforma Medica* [see this *Bulletin*, 1937, Vol. 34, p. 378] the author describes the nature of the country in the Lower Giuba, in so far as this has a bearing on its malaria problems, and discusses the measures that should be taken to control the prevalence of that disease. N. W.

SERRA (G.). A propos de 15 nouvelles observations d'Européens atteints de malaria et traités par l'association quinine-paludex. [**Fifteen Cases of Malaria among Europeans treated with Quinine-Paludex.**—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 39-49.

Clinical details are given of fifteen cases of malaria among Europeans, all of whom were treated with paludex associated with quinine. The results were good. Schizonts and gametes of *falciparum* disappear from the peripheral blood in from four to six days; fall of temperature and improvement of the patient's condition precede the disappearance of parasites. The daily dose of quinine recommended approximates one cgm. per kilo of body weight; the dose of quinimax one and a half to two cgm. per kilo. The smaller dose of quinimax is sufficient for fully-grown adults; the larger dose is recommended for young people. Quinimax and quinine in moderate doses are said by the author to be more effective and more rapid in action than massive doses of either drug given alone. N. W.

MASELLI (D.). Sulla cura della malaria nella emoglobinuria da chinino. [**Treatment of Malaria associated with Quinine Haemoglobinuria.**—*Polichinico.* Sez. Prat. 1937. Apr. 12. Vol. 44. No. 15. pp. 704, 707-8, 711-12, 715-16.

The author records two cases of haemoglobinuria associated with malaria and the administration of quinine. One case was successfully treated with quinine; in the second case the administration of quinine

was followed by a return of the haemoglobinuria which was more severe than the primary attack. This patient made a complete recovery when treated with atebirin. A fairly lengthy review of the Italian literature of the subject is contained in the paper. N. W.

DECHERD (George M.), Jr. **A Fatality after Atebrin-Plasmochin Treatment of Malaria.**—*Jl. Trop. Med. & Hyg.* 1937. Apr. 15. Vol. 40. No. 8. pp. 90-91. [14 refs.]

A man aged 28, a painter by trade, suffering from malaria, *Pl. vivax*, was treated with atebirin 0.1 gm. and plasmochin 0.01 gm., three times a day. Seven doses were given in all. The treatment was stopped and quinine substituted because the patient developed icterus and tenderness of the liver. He died six days after the commencement of treatment with the symptoms of acute toxic hepatitis. No post-mortem examination was made. N. W.

DE (R. K.). **Treatment of Malaria in Children with Atebrin-Musonate.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 290-292.

Difficulties attendant upon the administration of quinine by mouth to 40 or 50 small children a day, at the height of the malaria season, in a tea-garden dispensary, induced the author of this paper to seek a simpler method of treatment. He experimented with atebirin musonate. Two injections were given, on successive days, to each of fifty children suffering from malaria. All the children were between six months and six years of age. The dose was 0.1 gm. of "injectable atebirin," dissolved in 3 cc. of distilled water; the injection was made into the buttock. The treatment controlled the clinical symptoms and freed the peripheral blood of asexual forms of parasites; it neither destroyed crescents nor prevented the formation of them. There was no local inflammatory reaction in any case but convulsions were noted after treatment in 5 cases and restlessness and vomiting in one. N. W.

SORGE (Giuseppe). **Il metodo di Maurizio Ascoli nella cura della malaria acuta.** [*Ascoli's Method in the Treatment of Acute Malaria.*]—*Riv. di Malarologia.* Sez. I. 1937. Vol. 16. No. 1. pp. 14-30. With 12 charts. [13 refs.] German summary.

This is a record of the treatment of twelve cases of acute malaria, four *vivax*, eight *falciparum*, by the intravenous injection of adrenalin, according to the method recommended by Ascoli. The conclusions are reached that adrenalin so administered has an indirect action on the parasites and reduces the temperature; that this action is more rapid and more marked in *falciparum* infections than in *vivax* infections, and that adrenalin makes all forms of malaria infection more amenable to quinine treatment. The dose of quinine and the duration of treatment can both be reduced. Adrenalin is of value even in pernicious attacks. Its use diminishes the chances of relapse. N. W.

FORTUNA (Sebastiano). **Un triennio di esperienze sulla cura di Maurizio Ascoli della malaria.**—*Riforma Med.* 1937. June 5. Vol. 53. No. 23. pp. 825-6, 829. [27 refs.]

RADVAN (I.) & ALEXANDRESCU (D.). Essai de thérapeutique des splénomégalies paludéennes par l'acaprine. Réduction rapide des splénomégalies palustres par l'injection d'acaprine. [**Treatment of Malarial Enlargement of the Spleen with Acaprine.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 362-366.

This is a record of the treatment of ten cases of malarial enlargement of the spleen, mostly chronic cases, with Acaprine. Acaprine is used in the treatment of piroplasmosis in domestic animals, for which it is a specific, but it has not hitherto been used in human medicine. The authors begin their treatment with atebirin for three days and then plasmoquine for three days, both drugs being given intramuscularly. This treatment, though causing disappearance of parasites and abolition of fever, has commonly but little if any effect on the size of the spleen. If the preliminary treatment be followed, after an interval, by an intramuscular injection of acaprine very rapid reduction in the size of the spleen takes place. The dose of acaprine given is not stated in each case; it is apparently 1.5 cc. of a 5 per cent. solution. In the vast majority of cases only one dose is required. The injection of the drug commonly gives rise to a series of symptoms which last, however, but thirty to sixty minutes; slight shivering followed sometimes by a rise of temperature, salivation which may be copious, polyuria and the passage of liquid motions are the symptoms noted. The authors consider them as in no way serious. N. W.

RAGIOT (Ch.) & MOREAU (P.). Essais thérapeutiques d'une nouvelle formule à base d'alcaloïdes totaux du quinquina. [**Therapeutic Trial of a New Preparation containing Cinchona Alkaloids.**]—*Rev. Méd. et Hyg. Trop.* 1937. Mar.-Apr. Vol. 29. No. 2. pp. 85-93.

A preparation containing the chlorohydrates of quinine, quinidine, cinchonine and cinchonidine combined with resorcin and sodium chloride, which is manufactured under the proprietary name of Quinimax, was used in the treatment of a number of cases of malaria in Cochin China. Ampoules for intramuscular injection and tablets for oral administration were both used. Given in doses which had been found by SICAULT in Morocco to be effective the curative action was almost negligible. In increased doses, however, good results were obtained in cases of *vivax*, *falciparum* and *malariae* infections. In the four cases of apparent parasitological cure reported the total amount of chlorohydrate of quinine contained in the amounts of the preparation administered varied between 3.432 gm. and 5.316 gm. The preparation appears to be active, very well tolerated, easily handled and productive of no painful reaction when injected intramuscularly. Its febrifuge and tonic actions are well marked. [See also REYNTJENS; VAN NITSSEN, this *Bulletin*, 1937, Vol. 34, p. 597.] N. W.

VAN DER WIELEN (Y.). Prontosil en malaria quartana.—*Nederl. Tijdschr. v. Geneesk.* 1937. June 19. Vol. 81. No. 25. pp. 2905-2906. English summary (6 lines).

SERGEANT (Edmond). Les principes directeurs de la prophylaxie médicamenteuse collective du paludisme. [**Guiding Principles of Mass Drug Malaria Prophylaxis.**—*Arch. Inst. Pasteur d'Algérie*. 1937. Mar. Vol. 15. No. 1. pp. 1-7.

The first essential quality of a drug used for mass treatment is harmlessness; the second is cheapness. These must be secured even at the sacrifice of efficiency. The more toxic preparations may be used by a physician in the treatment of a case, even if the margin of safety be small, but their use is not justifiable for mass treatment. It is desirable that the drug used should act on both schizonts and gametes; the schizontocidal action is the more important. No drug yet produced is capable of procuring the *therapia sterilisans magna*. Mass treatment must perforce be contented if it can procure a non-sterilizing clinical prophylaxis. It is possible to keep imported labour or expeditionary forces in a state of latent infection thus enabling them to become acclimatized without risk and to preserve their efficiency during the process. Among a native population the object is to prevent recrudescences and relapses in those already infected and the effects of primary infections in those hitherto free from infection. As no drug sterilizes the victim of malaria its administration does not interfere with the production of a state of premunition. Mass medical prophylaxis should be continued throughout the transmission season and the drug used should be administered daily. Emphasis is laid on the necessity of adequate control of all mass distribution of drugs and of the systematic verification of the results achieved. *N. W.*

SCHÄFER (Hans). Ueber Malaria Chinin-Plasmochinprophylaxe in Sumatra. [**Quinine-Plasmoquine Prophylaxis of Malaria in Sumatra.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. June. Vol. 41. No. 6. pp. 459-461.

The author found that an eight-day prophylactic treatment with 0.6 gm. quinine sulphate and twenty mgm. plasmoquine of 1,253 Javanese, who had immigrated to Sumatra, reduced the malarial incidence from 30 to 0.8 per cent. The observations were carried out over four years. The cost was slight compared with the gain in working efficiency. He found the benign tertian more refractory to treatment than the malignant tertian infection. Of great importance for the success of the method is the commencement of the treatment from the first day, that is to say, the drug must be circulating in the blood before the parasites are transmitted. *E. D. W. Greig.*

FARINAUD (M.) & MOREAU (P.). La prophylaxie du paludisme par médicaments synthétiques en Indo-chine. Expériences en zone hyperendémique. [**Malaria Prophylaxis with Synthetic Drugs in a Hyperendemic Region.**—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 298-305. With 1 graph.

This is an account of the measures taken to protect the health and preserve the efficiency of the personnel of certain "penetration" posts, near the junction of the frontiers of Cambodia, Cochin-China and Annam, on high plateaus separating the watersheds of the Mekong and the rivers flowing to the Annam coast. This region is intensely malarious; in 1935 the morbidity was very severe, the mortality considerable and work was much hampered. In 1936 conditions were

much improved. The administration of synthetic drugs was chiefly responsible for this improvement. All the occupants of two posts received first of all a curative treatment consisting of quinacrine, 0.30 gm. a day for five days, followed by praequine, 0.02 gm. a day for five days. This was followed in one post by the administration of quinacrine 0.30 gm. once a week; in the other post quinacrine 0.20 gm. and praequine 0.02 gm. were given twice a week. There was no sign of drug intolerance and the results were much superior to those obtained by the use of quinine in like circumstances. The authors stress the importance of antimosquito measures being also carried out.

N. W.

BERNY (P.) & LE MINOR (L.). Note sur la prophylaxie médicamenteuse collective du paludisme par la prémaline. [**The Prophylaxis of Malaria with Premaline.**—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 367-368.]

Premaline is a new synthetic product which is similar in action to a combination of quinacrine and rhodoquine; it acts on both schizonts and gametes. Saut-Vata in French Guiana is an intensely malarious post; fifty men are stationed there. November to March is the most malarious time of the year. In the beginning of September 1936 the parasite index was 29.6 per cent. From 7th September to 15th December three tablets of premaline were given once a week; thereafter, till the 1st March, three tablets were given twice a month. No other antimalarial measures were used. The health of the post was excellent; there was no fever. Fifteen days after the beginning of the treatment the parasite index had fallen to zero and remained so till the end of February. In a neighbouring post, which was used as a control, malaria was as intense as usual, fatal cases occurring.

N. W.

TAUSSIG (Albert E.) & ORGEL (M. Norman). **The Kahn Test in Malaria.**—*Jl. Lab. & Clin. Med.* 1937. Mar. Vol. 22. No. 6. pp. 614-618. [21 refs.]

This paper contains a discussion of the discordant results reported by different observers concerning the occurrence of positive Wassermann and Kahn reactions in malaria. The authors' own observations show that positive Kahn reactions are not infrequent in malaria infections even when all possibility of syphilitic infection can be excluded. In 154 cases of malaria free from the suspicion of syphilis, treated in St. Louis, the percentage of positive Kahn reactions was 21. The percentage of positive Kahn reactions in the general population was 5.5 and in the medical wards of the Jewish Hospital, St. Louis, 4.6.

N. W.

SERGEANT (Edmond). Immunité ou prémunition dans les maladies à hémocytozoaires (paludismes, piroplasmoses). [**Immunity or Premunition in Haemocytozoal Diseases, Malaria and Piroplasmosis.**—*Arch. Inst. Pasteur d'Algérie.* 1936. Dec. Vol. 14. No. 4. pp. 413-417.]

This paper contains a concise and clear description of the phenomenon of premunition which is characteristic of malaria and piroplasma infections. As long as the infecting parasite remains latent in the body

so long will the body resist reinoculation with the same species. This resistance ceases when the latent infection is eliminated. The possibility of a true immunity replacing this state of premunition cannot be excluded in these diseases, but it has not yet been demonstrated.

N. W.

SERGEANT (Edmond). Definizione dell'immunità e della premunizione nelle malattie infettive. [**Definition of Immunity and Premunition in Infectious Disease.**—*Riv. di Parassit.* Rome. 1937. Apr. Vol. 1. No. 2. pp. 99–105. With 4 figs. [23 refs.] English summary.

This is an admirable exposition of premunition as contrasted with immunity. It covers much the same ground as the author's contribution above.

N. W.

MASCARÓ GARCIA (Daniel F.). Mecanismo del acceso palúdico. [**Mechanism of the Malarial Paroxysm.**—*Cronica Méd.* Lima. 1936. Dec. Vol. 53. No. 882. pp. 421–432.

The author has carried out a study of the conditions of the blood of animals—rabbits and dogs—under normal conditions and during histamine shock, recording the numbers of erythrocytes and leucocytes and the differential percentages of the latter in the peripheral blood before administration of histamine and in both peripheral and visceral blood during histamine shock. The results are compared with similar records in three stages of five patients with malarial paroxysms. In these he examined also the calcium and phosphorus, the blood pressure and coagulation time. He concludes:—

1. The corpuscle changes due to the parasites determine the clinical manifestations.

2. As the result of abnormal corpuscular metabolism, especially as regards the haemoglobin, toxic substances are produced and are discharged into the plasma when the merozoites are liberated.

3. These proteotoxic substances by an allergic process give rise to the malarial attack, which may thus be regarded as due to proteotoxic shock.

4. In producing the symptoms, histamine by its action on the sympathetic or parasympathetic plays an important part.

5. The body, especially by the reticulo-endothelial system, by exercise of its "antixenic" function [*i.e.*, reaction to the presence of foreign substances] brings about a return to normal.

H. H. S.

SHUTE (P. G.). **A Technique for the Inoculation of Known Numbers of Sporozoites as an Aid to Malaria Research.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 85–87.

A method whereby dissected salivary glands of mosquitoes were used for infecting patients with malaria was described by JAMES, NICOL and Shute in 1927 (see this *Bulletin*, 1928, Vol. 25, p. 573). A further refinement of this method is described by Shute. The glands are dissected in a drop of sterile Locke's fluid on a sterile glass slide and are crushed beneath a sterile cover-slip of which one edge is left protruding over the side of the slide. The cover slip is raised and washed several times with drops of Locke's fluid, the washings being added to the original fluid collected in the middle of the slide. The fluid on

the slide is drawn up in a hypodermic syringe and by adding further drops of fluid to the slide the whole is diluted to exactly 1 cc. The contents of the syringe are then thoroughly mixed. From this suspension 0.01 cc. is measured in a capillary pipette, spread on as small an area of a slide as possible, dried and stained. The total sporozoites can be counted using an Ehrlich's square eye-piece.

Using such methods it has been possible to inoculate patients with known numbers of sporozoites, varying from 50 to 560,000. N. W.

FULTON (J. D.). **Studies in the Chemotherapy of Malaria. The Distribution of Anti-Malarial Drugs between Red Cells and Serum.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 7-14. With 1 fig. [13 refs.]

Attempts to decide whether quinine becomes localized in the red cells, and thus held in high concentration in contact with the malaria parasites, have been made by a number of workers, using various methods, with rather conflicting results. The author has used the biological method of Rona and Bloch (*Biochem. Ztschr.*, 1921, Vol. 121, p. 235) which is applicable to the estimation of fractions of a milligramme of anti-malarial drugs, and depends upon an ingenious application of a surface-tension method to the determination of the velocity-constants of the hydrolysis of tributyrin by lipase, as well as the observation that in the case of human serum lipase, increase in the concentration of the anti-malarial in geometrical progression is accompanied by a fall in the velocity constants in arithmetical progression. The distribution between red cells and serum of twenty drugs of known constitution and anti-malarial activity was determined in this way.

No indications of general connexions between the partition coefficient and the nature of the compounds examined, or their anti-malarial activity, emerge from the results, except that four laevorotatory alkaloids occur together high in the list (although the highest is hydroquinidine, which is dextrorotatory), and that the first six compounds, with high partition coefficients, are good anti-malarials. No relationship is obvious for the others. In sixteen cases the partition coefficient is found greater than unity, ranging between 1.3 and 2.9.

W. H. Gray.

CHRISTOPHERS (S. Rickard). **Dissociation Constants and Solubilities of Bases of Anti-Malarial Compounds. I.—Quinine ; II.—Atebrin.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 43-69. With 6 figs. [43 refs.]

The non-arsenical anti-malarial drugs have as a common feature of chemical constitution (a) one nitrogen atom forming part of a heterocyclic nucleus (quinoline or acridine), as well as (b) one or more other basic centres. Amongst the synthetic drugs, for example, no quinoline or acridine derivative which does not contain an amino-group shows any indication of anti-malarial activity. The nitrogen atom (a) is very weakly basic, but the others may be fairly strong. The author points out that the latter may provide the mechanism for combination with the proteins of the tissues or parasite, so that the strength of the base will have an important effect upon the development of anti-malarial action, and he has accordingly determined the basic dissociation constants of quinine and atebrin.

For quinine, by electrometric titration with the glass electrode, the first dissociation constant, due to the quinuclidine nitrogen, corresponds to $\text{pk}_1=5.70$; the second, $\text{pk}_2=9.85$. Values in close agreement with these were obtained by indicator (cresol red). Atebrin has two well-defined constants, and probably a third, due to the acridine nitrogen, which is weaker than $\text{pk}_3=11.0$. Only pk_2 could be determined by titration and was found to have the value 6.47; owing to the very low solubility of the base, titration could not be carried into the range of the first constant, so the partition coefficient of undissociated base between ether and water was determined, and pk_1 calculated from this to have the value 3.87. A new solubility method gave figures in good agreement with these. The solubilities of the bases were also determined; atebrin base as 0.000084 [grammes per cc.?] varying little between 0° and 35°C., quinine trihydrate as 0.0007 at 20°, and anhydrous quinine as 0.0015 at 20°; the solubility curves of the two latter are given. The solubility product of anhydrous quinine is $10^{-8.33}$, and that of atebrin $10^{-8.68}$. Attempts to isolate atebrin mono-hydrochloride have been unsuccessful. *W. H. Gray.*

CHOLERA.

LEAGUE OF NATIONS. HEALTH ORGANISATION. EASTERN BUREAU, SINGAPORE. ANNUAL REPORT FOR 1936. pp. 8-40. With maps 1-8 & graphs 1-45.—**Plague in Countries; Plague in Ports; Cholera in Countries; Cholera in Ports.**

A great part of this report, so far as it relates to plague and cholera, is taken up by maps and graphs which give a clear readable view of the state of affairs during 1936 for the area covered. It is quite obvious that the arrangements for distributing information regarding infectious diseases with rapidity are extremely efficient. The data here set down are of the nature of records whose value will increase with time.

During 1936 "the improvement in the plague position in the Eastern zone" which was manifest during 1935 has continued. Thus, only 12,258 cases were reported from British India as compared with 27,923 in 1935. Java also reported decrease in 1936. "The satisfactory position as regards plague in 1936 has been reflected in the ports and in the absence of any plague infected ship being notified during the period under review."

In the case of cholera, like plague, the year 1936 was with some few exceptions, one of decrease. Siam showed a considerable increase and the disease was epidemically prevalent in Bengal in the early part of the year. "The Philippine Islands and all ports of China, Indo-China and the Dutch Indies have remained free from cholera throughout the year."

W. F. Harvey.

KIRIBAYASHI (S.) & AIDA (T.). **Fishing Vessels requiring Surveillance from the Standpoint of Disease Prevention, and Cholera Bacillus isolated from the Crew of Such Vessels.**—*Jl. Public Health Assoc. Japan*. 1937. Feb. Vol. 13. No. 2. pp. 1-2.

The fishing industry has greatly developed in recent years in Japan. It has been found that vessels of small type engage in fishing and may go far afield in this pursuit. Thus, the smallness of a vessel is no sufficient reason for relaxation of medical inspection. An illustration of this was afforded by the occurrence of a case of cholera on board a motor fishing vessel. The organism was isolated from the stool of the patient, who died, and two of his sailor companions were found to be carriers.

W. F. H.

TAYLOR (J.), PANDIT (S. R.) & READ (W. D. B.). **A Study of the Vibrio Group and its Relation to Cholera.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 931-945. [12 refs.]

Much that is of the highest importance to laboratory workers on the cholera vibrio is contained in this study. It deals with a total of 558 inagglutinable vibrios and has necessitated an examination of at least 1,000 different strains. The term inagglutinable is restricted "to vibrios which do not show the 'O' antigen of the typical *V. cholerae*." Serological investigations were carried out with strains which "did not agglutinate with a serum prepared against dried 'O' antigens of Inaba and Ogawa types" and the further serological testing of these strains was carried out by means of 33 sera prepared specially for the purpose. The specific characters of the antigenic vibrio furnishing these sera are given in a table.

A number of tests was applied to the differentiation of the vibrios under the heading biochemical reactions:—(a) fermentation of mannose, saccharose and arabinose, which are the sugars of *Heiberg*; (b) cholera red and indole reactions; (c) Voges-Proskauer reaction, in that modification “in which d-naphthol is employed along with potassium hydroxide”; (d) haemolysis of goat erythrocytes and (e) gelatin liquefaction.

“In the course of this investigation no example of variation amongst the strains has been experienced in the course of ordinary subculture.”

A number of interesting points have emerged in this study and are set out in the discussion: (1) “On the basis of simple agglutination tests without a detailed antigenic analysis 56 per cent. only of the strains have been classified. In order to effect this, sera were prepared against 33 vibrio strains and 31 serological groups have been defined. Of the 311 vibrios classified, 57 were classified in Gardner and Venkatraman's groups II to VI The remainder belong to newly defined serological groups. . . . It is unlikely that a series of the size dealt with here includes more than a fraction of the existing vibrio types The serological heterogeneity of the cholera-red negative strains is of a very much higher degree than of the cholera red positive organisms.” (2) Similar heterogeneity was demonstrated by grouping on the basis of a combination of reactions with six sugars, the cholera-red and the Voges-Proskauer tests. By this means 17 different types of inagglutinable vibrios were capable of separation and of these 13 had been isolated from cases of ‘clinical’ cholera. It was found “that the results of serology and the cholera-red test are, with extremely few exceptions, uniform. The Voges-Proskauer test to a marked extent follows the cholera-red test.” In fact, “with the inagglutinable vibrio strains it appears that an almost infinite variety of combinations is possible, although the vibrios within one serological group are for the most part uniform on all counts.” (3) In this series of *inagglutinable* vibrios the authors found little evidence of causal relationship with cholera. The ‘Rangoon Rough’ strain may possibly prove to be an exception to this statement for it showed a relatively high incidence in an epidemic year, but the evidence is incomplete.

Conclusions are drawn on the strength of the work done in this large vibrio series and they may be set down as:—(1) “Vibrios of serological type differing from the true *V. cholerae* do not produce cholera.” (2) “Observations made on the typical vibrios would not suggest that it is likely that the inagglutinable strains can develop into the typical agglutinable form.”

An appendix gives all the details of technique and 11 tables containing the data on which the findings are based. W. F. H.

SHRIVASTAVA (D. L.) & SEAL (S. C.). **Preparation and Properties of a Specific Polysaccharide from a Strain of *Vibrio cholerae*.**—*Proc. Soc. Experim. Biol. & Med.* 1937. Mar. Vol. 36. No. 2. pp. 157-161.

All the details of the method of preparation of a specific polysaccharide of the cholera vibrio, known as Inaba variant group VI, are given in this communication. The polysaccharide gave zone reaction with homologous antiserum between dilutions of 1-4,800 and 1-150,000 and then “a gradually increasing floccular reaction up to 1-12,000,000 after which it disappeared.” Specificity was further proved by testing

antisera of group I to VI vibrios for precipitin reactions to "Inaba variant (group VI)" polysaccharide and "Inaba (group I)" polysaccharide. These were either specifically positive or specifically negative. It was especially interesting to note that three El Tor antisera were not reactive with the Inaba polysaccharide. "El Tor strains cannot be differentiated from cholera strains by 'O' agglutination (GARDNER and VENKATRAMAN); or by the vibrio polysaccharides prepared by Bruce WHITE, but they appear to be differentiated serologically by the polysaccharide used in the present experiments." W. F. H.

WHITE (P. Bruce). **Regarding Alleged Transmutation in Vibrios.**—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 490-492.

The mutation of the cholera vibrio is, as the author points out, constantly invoked as an explanation of the appearance of strains with characters quite different from those of their alleged parents. He is evidently raising a warning voice against a too ready acceptance of what he calls the *fait accompli*, as representative of the true causal sequence of events. That a first plating of stool should afford colonies genetically related is a "matter of pure assumption." Again, "the possibility of intercurrent infection with vibrios during mouse passage experiments is not entirely ruled out." Heart blood cultures from dead or moribund mice may yield vibrios which have invaded the organism from the intestine and have nothing to do with the cholera vibrios administered. The author, however, does not press intercurrent infection as the probable origin of the "mutant" strains. When, on the other hand, a culture "infected with a particular bacteriophage is alleged to have been derived from one in which that bacteriophage is absent," he, himself, considers that "the simple and obvious indication is that the alleged mutant cultures are not derived from the parents presented." W. F. H.

SEAL (S. C.). **Rough and Smooth Cholera Vibrios in Relation to their Mode of Division and Growth.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 991-999. With 6 plates.

Rough colonies of *V. cholerae* are opaque and may vary in "roughness" from the slightly granular to those with a highly rugose surface, and irregular margin, which are described as "medusa-head" colonies. Smooth colonies are translucent and have a regular margin. There are many differences between the organisms composing these two types of colony and these may be classified under the headings, cultural characters, clinical constitution, biochemical serological and immunological behaviour, toxicity, metabolic activities and surface charge. The present study is devoted to determining "whether there is also a difference in the mode of growth of the individual bacteria comprising these rough and smooth colonies." The growth and division of the bacteria was continuously observed under dark ground illumination, the technique of which is given in detail. It was found that "a combination of 0.5 per cent. agar and 12 to 15 per cent. gelatin forms a satisfactory medium for watching the growth of the rough and smooth types." An exact correspondence of the mode of division from a single vibrio of the rough and the smooth colony was found to that for organisms from similar colonies of the *Salmonella* group and it seems possible that the phenomenon is a general one. The essential difference

between the two vibrios "depends upon the degree to which the contiguous cells adhere to each other after undergoing division." The final smooth colony is produced by the vibrios sliding past one another to form an even and compact mass. In the rough colony there is none of this tendency for the bacteria to slip past each other and "the cells after division tend to adhere to each other more firmly, leading to the formation of bending and branching chains and irregular masses with many open spaces, projections, angles and sometimes chains, the final cluster being thus jagged and uneven in appearance." Several very instructive plates accompany the article to illustrate the process. W. F. H.

READ (W. D. B.) **A Note on the Bacteriological Findings in Clinical Cholera in Calcutta in Relation to Epidemiology.**—*Indian Jl. Med. Res.* 1937. Apr. Vol. 24. No. 4. pp. 979-990. With 1 chart.

In Calcutta cholera is constantly present and there is no reason to suppose that the cases admitted to hospital are selected. "The figures of the Campbell Hospital and those of the Calcutta municipality are in consonance." In this communication an examination is made of the findings and figures for cholera during the years 1934-36 and a graph and tables have been prepared showing these for 4-weekly periods. Seasonal variations in the admissions to the Campbell Hospital are recognized and the figure of 100 admissions per 4-weekly period has been arbitrarily taken as "demarcating the commencement and termination of the epidemic period." This leaves an interepidemic interval and it has been divided up by the author into a post-epidemic and a pre-epidemic period. "The pre-epidemic period is defined by a change in conditions, characterized by an increase in the mortality rate together with an increase in the percentage of the typical *V. cholerae* without any marked increase in the total number of cases occurring." "Proved" cholera cases are taken to be those in which typical agglutinable vibrios have been isolated *plus* fatal cases unexamined. Non-examination of stools in conjunction with fatality is taken to mean that the patients were admitted to hospital in a moribund condition and that they would have probably shown agglutinable vibrios. It was found that the mortality of "proved cholera" did not vary greatly throughout the year. Cases diagnosed as cholera and furnishing inagglutinable vibrios were at their maximum in the epidemic periods and one post-epidemic period of the two years investigated. W. F. H.

PLAGUE.

GUIART (Jules). La peste reviendra-t-elle? [Will Plague Return?]
Rev. d'Hyg. et de Méd. Préventive. 1937. Apr. Vol. 59. No. 4.
pp. 241-247. [14 refs.]

The author contends that of the two rats which play a rôle in plague, *Mus rattus* and *Mus norvegicus*, the former is much the more important. *Mus rattus*, the black rat, is a domestic rat and may be said to live in close association with man. It came originally from India and was introduced into Europe in the 12th century, after the Crusades. The great European epidemics of the 14th and 15th centuries were the result. *Mus norvegicus*, the sewer rat, displaced the black rat in Europe and so plague disappeared, because the sewer rat is not a commensal of man. The argument goes further than this, for it applies to the differences in action of the fleas which are peculiar to the two rats. *Xenopsylla cheopis* is the special flea of *Mus rattus*, which is the rat that abounds in warm countries. It is *Xenopsylla cheopis* which has a predilection for man and which transmits plague from rat to man; it is for this reason that human plague abounds in warm countries. The flea infesting *Mus norvegicus* is *Ceratophyllus fasciatus*, without any part to play in the transmission of plague from rat to man, although quite capable of transmitting the disease from rat to rat. If, therefore, plague has disappeared from Europe it is because the rat and flea of Europe are *Mus norvegicus* and *Ceratophyllus fasciatus*, respectively.

When, however, a steamer arrived from India in the Seine in 1917 it had plague-stricken *Mus rattus* on board with its flea parasites *Xenopsylla cheopis*. A case or two of human plague occurred at Levallois, but did not extend further to man. An epizootic next broke out among rats. The rats had multiplied and there was great mortality among these in 1918 and 1919. In 1920 a small epidemic broke out, for which the sequence of events here narrated is regarded as responsible. It was, however, vigorously dealt with and suppressed. The deduction is made that at all costs *Mus rattus* must not be allowed to re-establish itself in Europe. W. F. Harvey.

PUBLIC HEALTH REPORTS. 1937. Apr. 2. Vol. 52. No. 14. pp. 412-414.—Overseas Transmission of Bubonic Plague. A Danger almost Eliminated.

Maritime transmission of plague from one country to another is dependent mainly, if not wholly, on the escape of infected rats from ships and the transfer of their infected fleas to shore rats. This is how an epizootic is started and how ultimately human plague results. A survey of ships at Atlantic ports by the Public Health Service of America has disclosed that only 8.4 per cent. of calling ships were infested with rats. This figure, when compared with the 50 per cent. rat infestation of ships between 1925 and 1927, shows what the efforts made to free ships from rats has brought about. "The specific factors responsible for this satisfactory condition are effective fumigation, rat-proofing of vessels, international certification and intensive rat-infestation inspection." Rat-free vessels qualify for reduction of quarantine delays and the expense of port dues. Much more can be

saved by continuance of these preventive measures, for "it would manifestly be foolhardy to relax the precautions that have brought about the decrease of rat populations on ships." W. F. H.

VINCKE (I.) & DEVIGNAT (R.). Le foyer de peste du Lac Albert. [**Lake Albert. A Plague Focus.**].—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 87–110. With 2 maps & 1 chart.

The existence of plague infection in the region of Lake Albert was more or less suddenly discovered in 1928 by a medical missionary. Further investigation followed, which confirmed the original announcement and it is stated that probably plague has been prevalent in this part of the Belgian Congo for 30 years. It seems to have been introduced from Uganda. The natives of the shores of Lake Albert and of Uganda belong to common stock; the same intermediate host, *Mastomys coucha*, var. *Ugandae* and the same vector fleas, *Xenopsylla braziliensis* and *cheopis*, are concerned in the transmission of the disease.

A novel method was adopted for defence of the villages against rats. Deratization of the villages themselves had been carried out some time before and was apparently still effective. A trench was now dug around the village of width 45 cm., depth about a metre and with vertical sides. Drainage was provided for in a direction away from the village. The rats coming in from the bush attempt to jump the trench, fall in and cannot climb out again. Some of them escape back again to the bush by the drainage channels. The soil of this region was favourable to trenching and it was easy to make repairs to landslips. W. F. H.

GERBER (M.). **Plague Campaign, 1935.**—*Bechuanaland Protectorate Ann. Med. & San. Rep. Year 1935.* Appendix A. pp. 25–35.

Plague campaigns tend to be long continued. In this case we have the account of one which has been originated, prosecuted and closed all within the space of 12 months. Rodent plague was discovered early in 1935 in close proximity to the Bechuanaland border. It was therefore decided to have Europeans "specially trained in rodent surveys and rodent destruction measures" with a view to combating the menace. This was done, the instruction obtained, surveys instituted and anti-plague measures adopted. The last of the rodent officers engaged in the work was discharged in November 1935. By that time there were definite signs that the veld rodents were breeding again and that the plague mortality among them had disappeared. It usually "takes 8 to 12 months for an epizootic of rodent plague to burn itself out . . . an epizootic of rodent plague kills off about 90 per cent. of veld rodents, mainly gerbilles. It takes about three years for the 10 per cent. remaining to breed up to their normal density of population and when this has taken place, plague again breaks out." Thus it is improbable that another epizootic will occur for another 3 years.

An important part of the campaign employed was to use cyanogas for rodent disinfestation. All European traders and farmers were urged to purchase pumps and cyanogas. All consignments of grain and hides on the railways were disinfested. In the Native reserves the co-operation and active assistance of the chiefs were obtained, in

order to have huts and granaries treated with cyanogas. Altogether 39,186 huts were so treated. By the end of July 1935 nearly every native village where rodent plague was found had been dealt with and was practically rodent-free. No human epidemic developed, but two human cases of bubonic plague were discovered and both of those recovered.

It is a little disappointing to note that, although each native tribe "was supplied with a certain number of pumps and cyanogas free of charge" and that no lack of assistance was rendered to government officers by the chiefs, the expectation that the natives would continue with the work was not wholly fulfilled. "No sooner had the rodent officer completed work in a village and left than the residents settled down and took no further measures in the majority of instances."

W. F. H.

RAYBAUD (A.). Le rôle du chat dans la transmission de la peste. [**The Rôle of the Cat in Plague.**]—*Marseille-Méd.* 1937. Dec. 25. Vol. 73. No. 36. pp. 713-718.

The cat may be used effectively as a check upon the increase of rats but this is not to be regarded as a very efficient antiplague measure. Indeed the cat itself may develop and transmit plague. A number of examples are given where this has taken place. It is pointed out that *Ctenocephalus felis* will "bite man as well as *Xenopsylla cheopis* and better than *Ceratophyllus fasciatus*." The cat flea is a carrier of plague.

W. F. H.

GIRARD (G.). Technique simplifiée de prélèvements pour identification du bacille pesteux sur le cadavre. Son application à Madagascar. [**Simplified Technique for the Diagnosis of Plague Bacilli Post Mortem.**]—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 240-247.

The native of Madagascar, although objecting to post-mortem examination, makes no objection to the diagnostic puncture of organs in the dead body. It is this method which has been elaborated to establish a diagnosis and thus prevent the spread of pulmonary plague. In the living patient the punctures are made of the bubo. After death aspiration of material from the liver and from both lungs is carried out. Several washings of the aspirating syringe with 3 cc. of 0.8 per cent. salt solution provides a suspension, which is rubbed on to the scarified abdomen of a guineapig. Where delay in carrying out the examination must take place, the use of the following fluid for suspension has proved satisfactory:—Calc. carbonate 2; glycerin 20; water 80. Experiments have been made which show that, at temperatures of 17°, 25° and 37°C., such a suspension will still serve for test up to 6, 6 and 3 days respectively. Smears are made from the suspensions and, on arrival at the laboratory, culture and animal tests are also carried out.

W. F. H.

BESSONOWA (A.). Noch ein Fall von Pigmentbildung des Pestbazillus. [**Another Case of Pigment Formation by the Plague Bacillus.**]—*Giorn. di Bacteriol. e Immunol.* 1936. May. Vol. 16. No. 5. pp. 754-760.

Deviations from the usual characters which define a bacterial species are of both theoretical and practical interest. Pigment

formation is not one of the distinguishing features of colony growth in the plague bacillus and indeed was not even described as occurring until the year 1927. Various strains have however now been isolated with this peculiarity. The cultures in which the phenomenon appears are usually old, but the capacity to produce pigment is transmissible to subculture growths. In the present instance the pigment-producing strain had been obtained from India and isolated from a case of bubonic plague. Previous strains with the capacity for pigment production have given black colouration. The present strain was yellow and developed other colours in the various generations of subculture—brown and rose-pink. These pigment-producing strains of *Past. pestis* may very commonly give quite unpigmented growths on subculture. It takes 10 to 15 days for the pigment to develop. A whitish iridescent film free of bacteria also developed on the agar surface of the pigment-producing cultures. The usual tests were applied to the isolated organism to prove that it was, actually, *Past. pestis*.

W. F. H.

SOKHEY (S. S.) & MAURICE (H.). Sur les pouvoirs protecteurs relatifs de vaccins antipesteux préparés, les uns au moyen de cultures tuées par la chaleur, les autres au moyen de cultures vivantes avirulentes. [**Protective Power of Heat-Killed Virulent and Living Avirulent Plague Vaccines.**]*—Bull. Office Internat. d'Hyg. Publique.* 1937. Mar. Vol. 29. No. 3. pp. 505-513.

Measurement of protective power and of virulence is attainable by using a dose of which the content in bacilli is known and by using the white mouse as the testing animal because it is susceptible and gives a constant reaction. One of the objects of the research work here described was to measure the relative immunizing power of killed virulent bacilli and living but avirulent bacilli. A most important point in this comparison was that the same strain of organism was used for both these tests. The organism was rendered avirulent without loss of antigenic power by culture at 37.5°C. on agar for about 60 to 70 weeks with weekly subculture or by growing it continuously for 10 weeks in nutrient bouillon at the same temperature. Thus, for example, an original culture, which killed 5 mice out of 5 by subcutaneous injection of only 12 bacilli, failed to kill any mice by the 64th subculture even in subcutaneous dose of 64,000,000 bacilli. An experiment which made comparison of the protective value of the two types of the same strain of organism gave the minimum protecting dose against the standard infecting dose as 0.002 cc. for the vaccine killed by heat and 0.3 cc. for the avirulent living vaccine. These protective results are obtainable not in mice only but in guineapigs and rats also. The reason why previous workers have been unable to get immunization of these susceptible animals with killed cultures is that they have used too high a temperature for too long a time for the purpose of killing. The authors kill their cultures by heating for 15 minutes at 55°C. The value of this low temperature and short time is brought out by an experiment showing how the minimum protective dose for mice with a culture thus killed was 0.002 cc., whereas for a culture killed by heating one hour at 60°C. it was 1.5 cc. Killing with 0.5 per cent. phenol without heat is as good as heating for 15 minutes at 55°C., and more efficacious than if the killing is done with formol.

W. F. H.

DE VOGEL (W.). La vaccination antipesteuse à Java (Indes Néerlandaises) avec un virus vivant. Quelques résultats enregistrés jusqu'au 11 juillet 1936. [*Antiplague Vaccination with Living Organisms.*—*Bull. Office Internat. d'Hyg. Publique.* 1937. Mar. Vol. 29. No. 3. pp. 514-527. With 5 diagrams (1 folding).

The work of OTTEN in Java merits close attention because it is conducted on lines which endeavour to make comparison of the vaccinated and non-vaccinated under strictly comparable conditions of age and sex distribution, with the employment of an alternate case method of selection. So far as they go, the figures are very favourable to the use of living vaccine. A total of 37,435 vaccinated with mortality of 1.01 per thousand is set over against the total of 39,483 non-vaccinated with mortality of 5.05 per thousand. A five-fold reduction of mortality is evident here and OTTEN hopes to make the reduction a ten-fold one.

W. F. H.

ROBIC (M.). Sérothérapie dans la peste pulmonaire primitive. [*Serum Therapy in Primary Plague Pneumonia.*—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 204-208.

A former method of preparation of antiplague serum was to hyperimmunize horses by intravenous injection of living plague bacilli. This was given up owing to the danger of the manipulations and the severe reactions produced in the horses. It has now been revived by the author who, however, uses the avirulent strain "EV." It has been possible to reach a dose of two bottles of living plague culture, which is given intravenously. The results obtained with the new serum in animals and in bubonic plague are favourable and will be reported when the numbers treated are sufficient to support valid conclusions. In the present communication a description is given of a patient 26 years of age who contracted plague pneumonia from her husband. She was treated with the serum and received in all 1½ litres of which 720 cc. were intravenous. The treatment did not prevent death, but life was prolonged to 11 days instead of the 3 days, which is the usual limit for a patient with plague pneumonia.

W. F. H.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1937. Mar. Vol. 29. No. 3. pp. 528-535.—Instructions pour le service de la lutte contre la peste. [*Antiplague Instructions.*]

Poisons.—These ought to be slow of action so as to allow time for the rats to abandon houses and die outside, or in their nests: it is not desirable that infected fleas should be left in a house. The following poisons are recommended: (a) maize flour coarsely ground 35; the best wheat flour 35; grated cheese, ground dry fish, dried blood or ground up beef 15; commercial arsenic 15. (b) Fresh fish 85; commercial arsenic 15. (c) Slaughter-house blood heated to a jelly 60; barley, wheat or maize flour or ground salt-fish 25; commercial arsenic 15. The mixture can be spread on bread, banana or paper and it is necessary to alter the ingredients of the mixture from time to time to prevent the rats becoming accustomed to it and so ceasing to eat it. These poison baits are to be placed in the holes of

rats, on their tracks, on beams, under large pieces of furniture and in sheltered places. Twelve or more poisoned baits will be required for an ordinary house. Poison ought to be continuously put down in places where plague exists. In a small town or village where two to three days suffice to clear houses of rats, it will be sufficient to put down poison once a month. If no plague has occurred for a year, poison baits will only be required every six months.

Traps.—As a method of rat extermination this is expensive and of doubtful value. It is used to obtain rats for the diagnosis of the existence of plague and determination of the proportion which are infected. A man can attend to 100 to 200 traps a day. In the large towns and ports where plague exists, 40 to 50 traps should be set per day per 1,000 inhabitants. Baits should be of substances common in the locality and should be handled as little as possible. It is also necessary to clean traps thoroughly before they are returned to use. Rats which are captured alive must be asphyxiated and then combed for fleas. The flea is placed for 24 hours in pure phenol to make it transparent, so that its species and sex may be made out. The total number of fleas divided by the number of rats gives the "flea index."

Rat Autopsy.—These rats are immersed for 10 minutes in 5 per cent. creoline containing a little soap or kerosene. Signs of plague infection are: Intense subcutaneous haemorrhage; inguinal, axillary and cervical buboes of purple colour, surrounded with gelatinous oedema; pleural and pericardial effusion; small haemorrhages and consolidations in the lungs; a purple, friable, enlarged spleen with pin-head abscesses and the same lesions in the liver; deep red enlarged suprarenals; enlarged and haemorrhagic mesenteric and retroperitoneal lymph nodes. Films should be made from all lesions and stained. If there are no obvious plague lesions portions of spleen and liver should be ground up in a little sterile water and rubbed on the scarified skin of a guineapig with the pestle used in the grinding. The guineapig should die of plague in 5 to 10 days with characteristic lesions.

Indices.—Note should be taken of: (a) The number of rats of each species, (b) the number of males, females and pregnant females, (c) the number of rats found infected with plague and their percentage, (d) the number of fleas per rat, classified according to genus, species and sex and the percentage number. The plague index or percentage of rats infected is of great value in judging the efficacy of antiplague measures. When fleas are most active and abundant, a 2 per cent. rat "plague index" presages the imminence of epidemic plague. If the flea index is not greater than 3 per rat, epidemic plague is not to be feared.

Protective Zones for Towns.—A clearance zone of 100 to 200 metres free of brushwood, vegetation, heaps of stones and collections of wood, etc., should be maintained round a town to prevent possibility of contact between sylvatic and domestic rodents. W. F. H.

WU (C. Y.). *Some Modern Trends in Plague Work.—Reports National Quarantine Service Ser. VII—1937.* pp. 108–127.

A very useful review of the practical problems of plague work is presented in this lecture under such headings as diagnostic methods, the problem of infected and infective fleas, flea investigations in China, serum therapy, vaccine prophylaxis and rat proofing. Most of the matter treated covers familiar modern ground.

A valuable method by which animals can be diagnosed as dead from plague, especially useful in the case of decomposed animals, is the examination of bone marrow from the humerus.

A shrewd reference is made to views which upheld the possible causation of plague through rodents other than rats or even transmission from man to man. When an epizootic of plague has broken out among the domestic rat population it may be quite difficult to get any of these animals for laboratory examination owing to the heavy mortality among them. It should not, however, be concluded on this account alone that the human outbreak is not rat-caused.

A distinction is drawn between infected and infective fleas. Not every flea which has become infected is able to transmit infection and, indeed, Indian observers have gone so far as to say "that even under the most favourable conditions only an occasional *infected* flea becomes *infective*." Three rat fleas appear to be common in China, *Leptopsylla musculi*, *Ceratophyllus anisus* and *Xenopsylla cheopis*. The author's observations "confirm the generally accepted view of the close correlation between a high *cheopis* index and plague incidence."

Little faith is placed in serotherapy, but "solid progress has been achieved in the realm of vaccine prophylaxis." An attempt is made by the author to "assess the relative merits of the three categories of vaccines." These are some of the advantages and disadvantages of each: (1) Agar grown vaccine is quickly and easily prepared and is simple to standardize. It gives a comparatively mild reaction. Possibly its potency might be increased by reducing the time and temperature in its sterilization. (2) Haffkine's vaccine is tedious to prepare and not easy to standardize. (3) Evidence presented in favour of the use of living avirulent virus as vaccine is regarded as impressive. This section on vaccines concludes with the remark that "until the connection between man and rodent is severed it is idle to hope for a complete eradication of plague in endemic areas."

In conclusion, the question of rat proofing is discussed. "The science and art of rat-proofing has come to the fore in recent years as the most effective measure in our concerted attack upon plague." This procedure is defined, "as the mechanical process whereby a structure is rendered safe from rodents." The method—owing largely to its temporary efficacy and costliness—has "found its greatest usefulness in the campaign against rats on board ships."

W. F. H.

HELMINTHIASIS.

VASSILKOVA (Z.). Sur la déshelminthisation des eaux d'égout épurées par méthodes intenses. [*Helminthic Ova in Sewage Works.*]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 5. [In Russian pp. 657-673. With 3 figs. [16 refs.] French summary pp. 673-674.]

Examination of the sewage effluent at the Toula works and of the sludge there and at Kojoukhov (Moscow) showed the presence of ova of ascaris, trichuris, enterobius, diphyllbothrium and taenia, up to nearly 2,000 per litre. In the Imhoff tank nearly all were removed (97 per cent.), in a second sedimentation reservoir 87 per cent.; biological filtration reduced the total by 18-26 per cent. only. Chlorine methods of purification did not affect the vitality of the ova. The sludge contained 466 ova per gram, the same five species being found; methane fermentation reduced this number by about a fifth. They might remain alive up to 2 years in sludge kept in the open. Methods suggested by the author for getting rid of or destroying them include sand filtration, raising the temperature in the methane reservoirs to 45°C., prolonging the sedimentation time and others. H. H. S.

BASNUEVO (Jose) & ANIDO (Vicente). Manera de conservar huevos de helmintos. [*Preservation of Helminth Ova.*]—*Medicina de Hoy.* Habana. 1937. May. Vol. 2. No. 5. p. 300.

The authors recommend the addition of 25 cc. of the following to 100 gm. of faeces: formol 15 cc., glycerin 20 cc., water 100 cc. If the faeces are not liquid or pasty 25 cc. distilled water should be added to homogenize them. If the eggs are scarce, he suggests addition of 100 cc. of water and passage through a fine-meshed sieve, collection of residue in centrifuge tubes, running down vigorously, pouring off the supernatant fluid and adding to the residue an equal amount of the formol-glycerin solution. They will thus be preserved, indefinitely. The process is good also, they state, for preservation of protozoal cysts. H. H. S.

DENECKE (Karl). Der Befall mit menschlichen Darmhelminthen auf der Elbinsel Finkenwärder und seine Ursachen. [*The Incidence of the Intestinal Parasites of Man in Finkenwärder, an Island in the Elb.*]—*Arch. f. Hyg. u. Bakt.* 1937. Mar. Vol. 117. No. 6. pp. 332-362. With 1 fig. [35 refs.]

There is a survey of the literature dealing with ascaris and trichuris infection in Europe varying from 1 and 4 per cent. respectively in Hamburg to 78 and 63 per cent. in Switzerland. The island of Finkenwärder lies across the boundary between Hamburg and Prussia with a population of 5,680, of whom 5,154 were examined by Telemann's technique and 1,000 by Fülleborn's gravity floatation method as well. Of this 1,000, the numbers positive for eggs to Telemann's and Fülleborn's techniques were respectively—for trichuris 276 and 115, ascaris 51 and 31, enterobius 6 and 7, *T. saginata* 4 and 0, Fasciola 1 and 0, Heterodera 1 and 0, mite 2 and 1. The total percentages of infection found were: trichuris 18.76, enterobius 5.91, ascaris 5.06, taenia 0.44, *H. nana* 0.01. The incidence is further dealt with by

localities, age and sex. In 2,466 persons in whose gardens human faeces from pail privies was not used as manure the percentage of ascaris infection was 2·6 and of trichuris 12·8; in 2,375 in which it was so used the percentages were 7·9 and 26·0. In carriage of infection, drinking water was not concerned, but those in whose gardens salads or strawberries were grown had heavier infections with ascaris and trichuris than those in which they were not. *Clayton Lane.*

LING (L. C.) & YAO (Y. T.). **The Incidence of Intestinal Parasites in Kweiyang and Southern Yunnan.**—*Chinese Med. Jl.* 1937. Mar. Vol. 51. No. 3. pp. 381–384.

The incidence of intestinal parasites in 4 communities as displayed by two smears of unstated size, one made with normal saline, the other with Donaldson's iodine and eosin.

The places are about 5,000 feet up in latitudes about 22 to 26. The disclosed percentages of infection were: *Ascaris* 65·91 to 92·65, *trichuris* 0–34·91, *enterobius* 0 to 0·12, *E. coli* 4·55–17·16, *E. histolytica* 0 to 2·83, *E. nana* 4·08 to 10·38, *I. butschlii* 0 to 3·77, *Giardia* 2·7 to 6·81. All of 106 miners had one infection or another.

C. L.

LEATHERS (W. S.) & KELLER (A. E.). **The Prevalence and Distribution of *Ascaris lumbricoides*, *Trichuris trichiura* and *Hymenolepis nana* in South Carolina.**—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 292–302.

A faecal survey in 44 counties of South Carolina from examination of 0·05 gram of faeces diluted in decinormal caustic soda solution.

Faecal specimens numbered 28,875 from whites. Of these 4 per cent. (0·2 to 11·4) were positive for ascaris covering 41 counties. So far as it is considered fair to compare examinations made by different techniques this may be taken as a slight rise in infection from 3·6 per cent. from the period before 1921. The incidence was highest in young children before and after beginning to go to school; the average intensity was 19,000 eggs per cc. of faeces and of the infections 69·4 per cent. were classed as very light, 22·1 as light, 4·3 as moderate, 3·4 as heavy, and 0·9 as very heavy. The average egg count increased from 7,126 per cc. in a member of a family in which he was the only one infected to an average of 51,169 in each infected person when these numbered 5 or more. In 1,172 the type of ascaris egg was noted and in 40·7 per cent. all were unfertile with an average of 2,570 eggs per cc., in 30 per cent. all were fertile with a like average of 11,300, and in 29·3 per cent. there were both fertile and unfertile eggs with 48,300 as the average. In 595 negroes the percentage of infection was 15·1 and the mean egg numbers 25,000 per cc. Only 11 of the 28,875 specimens from whites showed trichuris eggs to this method of diagnosis, and only 187 showed onchospheres of *Hymenolepis nana*, while in them hookworm eggs were found in 24·8 per cent. *C. L.*

UNION OF SOUTH AFRICA. ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH FOR YEAR ENDED 30TH JUNE, 1936 [THORNTON (E. N.), Secretary]. [*Bilharziasis* pp. 26–28.]

A survey of what is being undertaken in the Union for the prevention and cure of bilharziasis.

A survey of snails is in progress, from which it appears that *B. forskalii* prefers standing water with an earth or mud bottom, *L. natalensis* water running over rocks, or vegetation in standing water, *M. tuberculata* rocks preferably in standing water, some 90 per cent. being found so attached, *P. africana* vegetation in standing water, *P. costulatus* rocks in running water, and *D. pfeifferi* rocks in standing water. Native children have interested themselves in collections. *B. forskalii* has proved to be more widespread than suspected and if it is found to be as easily infected in the Union as it is in Mauritius it will prove as big a problem there as is *P. africana*. Of 726 children examined in 21 native schools 63.6 had ova of *S. haematobium* in the urine. Treatment camps for Europeans do temporary good to the treated and, by their useful propaganda value, help in prevention. In the schools the means of infection and prevention have been explained, and a beginning is being made to provide safe swimming pools for them. The fruit of the local *Balanites* (*B. maughami*) has proved deadly to snails and cercariae, but the tree grows very slowly, its fruit ripens and falls from mid-winter [? June] to September, when swimming is least practised, and it never grows naturally near water. In three treatment campaigns foudadin was preferred to other drugs for convenience of handling, because it can cure if care and common sense are used, and because large treatment camps have not had to be arranged for it as has been the case with what seems to be thought the more successful tartar emetic. C. L.

CAWSTON (F. Gordon). **Recent Progress in the Cure of Bilharzia Disease in South Africa.**—*Parasitology*. 1937. Jan. Vol. 29. No. 1. pp. 1-3.

"The efficacy of the drug employed for treating this infection would seem to depend very largely upon its antimony content."

"Experience would show that the vast majority of persons receiving foudadin are incompletely cured of bilharzia infection in South Africa. Due consideration has not been paid to the fact that this easily applied compound contains only 13.5 per cent. of antimony metal instead of 36.46 per cent. as contained in tartar emetic. To reach even half a gram of antimony metal about 60 cc. of foudadin are required. This conclusion, reached by investigating the proportion of metal in antimony derivatives, is borne out by clinical experience.

"The secretary of a hospital board in the Transvaal states: 'It appears that the drug, 'tartar emetic,' is the only sure cure for bilharzia in the long run. During the last ten years about thirty-five patients have been treated with foudadin in this hospital and, invariably, the cases have returned as uncured after a month or two. About two years ago seventy-five school children were given tartar emetic injections as laid down by the Department of Public Health. These cases were all cured permanently.'"

C. L.

CAWSTON (F. G.). **Bilharzia Disease in the Cape Province.**—*South African Med. Jl.* 1937. Mar. 27. Vol. 11. No. 6. pp. 208-209.

The only schistosome present in the Cape Province is *S. haematobium* carried by *Physopsis africana*, which snail, it is believed, is absent from streams guarded against human pollution. The need that it

should be demonstrated to school children is urged. The matter of weight of infection has been inadequately realized.

"Professor G. A. H. Rose told me he considered that a patient would harbour hundreds of the parasites and that he had counted a thousand in an experimentally infected animal. I was given about a hundred adult schistosomes in a small excised piece of omentum from a ram at Humansdorp and suppose that this one animal harboured several thousand."

Treatment must be designed accordingly and the advice is that there should be given within a month 20 or 25 grains of a combination of tartar emetic and sodium chloride by injections given on alternate days.

C. L.

CAWSTON (F. Gordon). **The Effect of Fish Culture on Fasciola Infection and Schistosomiasis.**—*Jl. Trop. Med. & Hyg.* 1937. May 1. Vol. 40. No. 9. pp. 103–104.

"Fish culture might well be considered in the control of schistosomiasis and fluke disease in stock and of Bilharzia infection of man in parts of Rhodesia and South Africa or other countries where river-water is sufficiently pure and constant. Unfortunately, infection is commonest where river-beds sometimes become dry and in an environment unfavourable for the cleaner fish.

"The Bilharzia committee and Transvaal Education Department are encouraging farmers and others to maintain domesticated duck and fish on their farms where various water-fowl are rapidly disappearing.

"By introducing Black Bass into dams of water Bilharzia infection and Fasciola disease may already have been controlled in some measure in Zululand.

"A visit to private water-lily pools in Natal where *Physopsis* was once breeding extensively resulted in the collection of but a few examples, and this fact could be satisfactorily explained only because the pools are now well stocked with small fish, principally minnows, which would both attack the snails and remove much of the decomposing leaves on which the snails themselves thrive."

C. L.

SARGENT (R. M.). **Bilharzial Invasion of Appendix.** [Clinical Memoranda.]—*Brit. Med. Jl.* 1937. Mar. 27. p. 663.

An appendix removed for symptoms of appendicitis had in it schistosome ova. Examination of faeces then made showed no ova, but the urine showed those of *S. haematobium* (for which infection there had never been evidence) and these disappeared after "a heavy course of a proprietary antimony preparation."

C. L.

KAUFMANN (Willy). La schistosomiase de l'appendice par rapport à la schistosomiase de l'intestin et sa signification clinique. [**Appendicitis and Schistosomiasis.**]—*Arch. Internat. Méd. Expér.* 1936. Dec. Vol. 11. No. 4. pp. 721–750. With 8 figs. [137 refs.]

After discussion of the relationship of parasites to appendicitis and particularly of the three schistosomes of man, three cases are described of appendicitis with appendicectomy, the eggs seen in sections of the organ being judged to be those of *S. haematobium*.

C. L.

HARKAWY (N.). La bilharziose humaine dans le cercle de Bangou. Essai de traitement par divers composés antimoniaux. [**Urinary Schistosomiasis in Bangou (Belgian Congo) and its Treatment by Antimonials.**—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 17-25.

In Bangou the results of treatment of urinary schistosomiasis have not been comparable to those obtained with foudin in Egypt or Dn 18 in Morocco.

Of 43 patients, 5 had Dn 18 with no relapse, 11 had foudin with 2 relapses, 11 tartar emetic with 1 relapse, 8 had Dn 18 and tartar emetic with no relapse, 1 had SDT and emetic with no relapse, 3 foudin and emetic with 1 relapse, 1 had foudin and Dn 18 with no relapse, 4 had all 3 drugs and 1 relapse. Doses and length of treatment are given in tables. C. L.

GUILLIER (M.). Au sujet de la présence de foyers de bilharziose vésicale dans la région d'Ambanja. [**Foci of Urinary Schistosomiasis in Ambanja (Madagascar).**—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 13. No. 1. pp. 112-113.

These two foci are in Madagascar.

C. L.

STIVEN (H.). **Egyptian Splenomegaly.**—Société Internationale de Chirurgie Xe Congrès, Le Caire—30 décembre 1935. 14 pp. With 9 figs. 1935. Brussels: Imprimerie Médicale et Scientifique (Soc. An.), 34 rue Botanique.

A note by Stiven based essentially on his experience of over 800 splenectomies for this condition.

He quotes an unnamed authority as saying that with about 80 per cent. of the population infected with one parasite or another it is for the moment impossible to attribute Egyptian splenomegaly to Mansonian schistosomiasis, but in his view the relationship of the two in St. Kitts and his own experience with the places of origin of his first 400 splenectomies supports the connexion. The public Health Department shows that splenectomies are performed all over the Delta but none in Upper Egypt, and Barlow "categorically states that after many and repeated examinations and investigations no Planorbis snail is found in Upper Egypt, except a small variety at Kom Ombo which it has been found impossible to infect with miracidium hatching out of Schistosoma eggs." "The only remedy for this disease is the removal of the enlarged spleen, for it is found that the spleen continues to enlarge in spite of courses of tartar emetic; had the splenomegaly been due solely to Schistosoma Mansonii one would have supposed that a course of tartar emetic would have checked the disease." But with this should surely be taken the fact that though a follow up of 12 cases showed a well-marked gain in stature and general health they had all become reinfected. The steps of the operation are given in detail; it is undertaken only after a course of tartar emetic, a vermifuge, and 6 injections of neosalvarsan. It has a mortality in unselected cases of 12 per cent.; but, on the other side the "expectation of life is barely three years after the spleen has commenced to enlarge." It is particularly noted that in this disease, as in kala azar, the blood serum globulin is markedly increased.

C. L.

MARTINS (A. Vianna). Sobre a pesquisa dos ovos de "*Schistosoma mansoni*" pelo methodo da sedimentação, concentração. [**Search for Ova of *Schistosoma mansoni* by the Concentration Method.**]—*Brasil-Médico*. 1937. Feb. 27. Vol. 51. No. 9. pp. 319–321. [12 refs.] English summary.

The author refers to the various procedures that have been recommended for concentration of ova to facilitate research, *viz.*, Fülleborn's, Morin's, Fouad and Helmy's, Khalil's, Hoffman, Pons and Janer's, etc. Having occasion to study the foci of schistosomiasis in Bello Horizonte, State of Minas Geraes, Brazil, he employed the last, as follows :—

Two grams of faeces were taken and placed in a Borrel's flask with 10 cc. water, left for 10–20 minutes till softened, and then carefully broken up with a glass rod, gradually adding another 20 cc. water. The emulsion was then passed through a metal sieve 80–100 meshes to the square centimetre and collected in a conical urine glass and allowed to settle. The supernatant fluid was decanted and 50 cmm. of the deposit spread on a slide and examined.

The advantage of this sedimentation method of concentration over the direct smear is shown by the fact that whereas 10·5 per cent. were positive by direct smear 27·7 per cent. were positive by sedimentation. In three instances where no ova could be found by the former, 63, 70 and 219, respectively, were found by the latter method.

H. H. S.

KNOTT (James). **Fever and Schistosomiasis Mansoni. Report of Two Cases.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. Mar. Vol. 12. No. 3. pp. 306–309. With 3 charts. [Spanish version pp. 310–313.]

"Two cases of *S. mansoni* infestation are reported in two patients who had been out of an endemic area for two and nine years, respectively, and in which the patients had an acute febrile illness with acute enlargement of the spleen and liver. The fever was presumed to be due to the *S. mansoni* infestation."

C. L.

RODRIGUEZ MOLINA (R.) & PONS (Juan A.). Estudios hematológicos sobre la esquistosomiasis de Manson en Puerto Rico. [**Haematological Investigations on Cases of Schistosomiasis mansoni in Porto Rico.**]—*9a Reunión Soc. Argentina Patol. Regional, Mendoza*, 1, 2, 3 y 4 octubre 1935. Vol. 2. pp. 726–752. [47 refs.]

This study was carried out with great care and included the following : Counts of red and white cells, estimation of haemoglobin in gm. per 100 cc. of platelets, cell volume, colour index and differential leucocyte count. Details are presented in tabular form and are discussed in the text. The original should be consulted by those interested, because the variations are such that the results cannot satisfactorily be abstracted. The cases are classified into three groups according to the stage of the diseases : (1) Early toxæmia ; (2) Intestinal ; (3) Terminal, visceral. The last section of the article consists of short

observations on the treatment of the anaemia by foudadin, by Ferri et ammon. cit., by liver extracts, and, lastly, by splenectomy.

H. H. S.

VAN NITSEN (R.) Essais de traitement de la bilharziose intestinale par les sels de cuivre. Note préliminaire. [**Copper Salts in the Treatment of Schistosomiasis mansonii.**—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 77-82.]

Two copper organic compounds, dicuprene and paludex have cured 150 natives of intestinal schistosomiasis.

Dicuprene (capro-oxyquinoline disulphonate of diethylamine) is a readily soluble, neutral, greenish powder with 6.5 per cent. of copper. A 10 per cent. solution is put up in 5 cc. ampoules, the contents of one of these being injected daily into the veins of each of 35 persons, 12 with acute and 23 with chronic illness; in the acute cases symptoms disappeared within 4 and eggs in 3 to 7 days; in the chronic cases eggs disappeared in 3 to 9 days, mostly after 20 to 40 cc. but in one patient after 50 and in another after 70 cc. had been given. At the time of injection there is a metallic taste in the mouth and in 1 patient there was haematuria after 6 injections of 10 cc. each; but it disappeared after 3 days of cessation of treatment and did not come on again when injections were resumed. This was the only possible ill-effect of the drug.

Paludex (cupro-oxyquinoline sulphate of soda) is much like dicuprene in appearance but has 8.37 per cent. of copper, and is given by mouth in tablets each of 20 cgm. the adult dose being 1.5 to 2 gm.; though van Nitsen prefers to start with 5 tablets and to increase the dose daily by 1 tablet, the dose of 2 gm. being reached on day 6 and continued daily to day 9, after which the course stops. Of 115 treated 18 were acute and 97 chronic illnesses. In 13 of the acute illnesses eggs disappeared in 6, and in five of them in 9 days, while symptoms disappeared in half after 2 days and in all after 5. Of 97 chronic illnesses eggs disappeared by 6 days in 39, by 9 days in 43, by 12 days in 9, the maximum being 18 days in 1, about half requiring up to 9 gm. and the rest more, even up to 23 gm. Observation has mostly been for not more than 8 days from the end of treatment, in 8 it was 2 to 3 weeks, in 2 one month, in 1 two months; but no relapses have been reported, most of the patients being inhabitants of the camp at Panda with its stable population.

C. L.

BARLOW (Claude H.). **The Value of Canal Clearance in the Control of Schistosomiasis in Egypt.**—*Amer. J. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 327-348. With 12 figs. on 2 plates, 1 map and 3 graphs.

"The use of canal clearance is proposed as a prime factor in a scheme for the control of human schistosomiasis in Egypt because it is efficient, inexpensive, and requires no teaching of new methods for its execution."

"Little has been written about the snail-environmental conditions of schistosomiasis, a knowledge of which is most important. The optimum environment for both *P. boissyi* and *B. contortus* is fairly clean water, not too deep or swift, with some flow, plant litter, sunshine and shade, good places for egg laying, few natural enemies, and an undisturbed situation. For food, *B. contortus* prefers *Potamogeton crispus*, while *P. boissyi* prefers a rank water grass.

"Intensive snail collections were found to deplete the snail population. This suggested the use of canal clearances as a control measure. An area of over 800 acres was chosen as the site of a clearance experiment. Alternate canals were cleared and the others were left undisturbed for controls. The division was made equal for comparison of results. Three surveys of the area were made: one the year before clearance, a second during the clearance year, and a third after clearance. Snails were collected from all control canals, counted, and returned to the water with as little disturbance as possible. Snails collected from experimental canals were kept and examined for infestations. The reproductive cycle of both *P. boissyi* and *B. contortus* is about two months. The time required for their food plants to grow after being weeded out is also about two months, so we chose a two months' interval between clearances in order to deprive the snails of food and disturb their sexual activities. The government's winter closure of the canals in December leaves the canals dry so that silt may be removed. The water is returned in February. Some snails which survive this dry season will be at their peak of reproductivity in April. April was therefore chosen for our first clearance.

"Clearances required the use of three gangs of 10 men each and 3 overseers. It was carried out during low water and took 6 to 7 days. This left the canals aligned, free from weeds, and with a minimum of snails. The only special implements used were nets made with steel frames covered with three grades of wire netting and designated chicken-wire, coarse, and fine nets. The nets have large handles and are sturdily built for rough usage. The netting is stretched flatly over the frames at the front edge and bellies at the heel of the frame.

"*P. boissyi* reduction in the experimental area was as follows: preclearance year, 7,359; clearance year, 1,499; postclearance year, 134. Simultaneously there was the following increase in the control area: pre-clearance year, 1,922; clearance year, 2,172; postclearance year, 2,632. *B. contortus* reduction in the experimental area was as follows: pre-clearance year, 3,776; clearance year, 1,073; postclearance year, 648. During the same period the control area yielded the following numbers: preclearance year, 2,768; clearance year, 2,130; postclearance year, 1,816. These reductions are presented by months in two tables and three graphs.

"Clearances over a period of years instead of only one year would have shown greater reductions. One year's work is insufficient to produce the desired results. Even so, the reductions are significant and gratifying."

C. L.

CAWSTON (F. Gordon). **The Resistance of *Melanoides tuberculata* (Müller) to *Schistosoma*.**—*Jl. Trop. Med. & Hyg.* 1937. Jan. 15. Vol. 40. No. 2. p. 16.

"The control of schistosomiasis in the Far East is handicapped because the intermediate hosts are operculated and resist desiccation. Though Melanoidae are represented, there is no evidence that schistosomiasis in South Africa is spread by any mollusc possessing an operculated shell."

C. L.

CAWSTON (F. G.). **The Control of the Bilharzia Snail-Host in South Africa and Other Countries.**—*Jl. Trop. Med. & Hyg.* 1937. Mar. 1. Vol. 40. No. 5. pp. 56-57.

The Government of the Union of South Africa deals effectively with anything liable to spread disease among stock, and with noxious weeds. It does not so deal with the snail host which spreads bilharziasis in man.

C. L.

SUGA (Yukio). Beiträge zur statistischen Kenntnis der Distomiasis. [Contribution to the Statistical Knowledge of Distosomiasis].—*Okayama-Igakkai-Zasshi* (Mitt. d. Med. Gesellsch. z. Okayama). 1937. Mar. Vol. 49. No. 3. [In Japanese pp. 624-634. [47 refs.] German summary pp. 623-624.]

In the Pathological Institute of the Medical Faculty, Okayama, 545 necropsies have been made during the last 14 years and liver infection with "*Distomum spathulatum*" [*Clonorchis sinensis*] was found in 43 (7.89 per cent.). The mean weight of the liver was 1,617 gm., most of the subjects being aged. Gall-stones were 2.5 times commoner in those with this infection than in the necropsies as a whole (as 11.63 to 4.48 per cent.). In 34.88 of the infections there were flukes in the gall bladder. In 24 infected persons there were more than 100 cc. of fluid in the abdominal cavity, in 10 marked jaundice, in 23.28 per cent. of the infected there was carcinoma of the liver. In 5 bodies flukes were present in the pancreas.

C. L.

Hsü (H. F.) & CHOW (C. Y.). Studies on Certain Problems of *Clonorchis sinensis*. II. Investigation in the Chief Endemic Centre of China, the Canton Area.—*Chinese Med. J.* 1937. Mar. Vol. 51. No. 3. pp. 341-356. With 8 figs. on 4 plates.

A continuation of the work of Hsü and KHAW [this *Bulletin*, 1937, Vol. 34, p. 395]. On the intensity of infection the authors have not worked from lack of time, but quote the work of others. Of the raw fish dishes favoured by the inhabitants they give details. Of 13 sorts of fish examined the tabled results are as follows for the six species cultured and commonly eaten raw: in 6 *Ctenopharyngodon idellus* 1,757 cysts, in 24 *Mylopharyngodon aethiops* 27 cysts, in 21 *Hypophthalmichthys molitrix* 4 cysts, in 6 *H. nobilis* 2 cysts, in 8 *Labeo collaris* 59 cysts, in 13 *Cyprinus carpio* 2 cysts. Other notable figures are—in 6 *Pseudorasbora parva* 340 cysts and in 8 *Squaliobarbus curriculus* 34 cysts, the gills of the last being commonly fed to cats and dogs, so that the source of their infection is, it may be concluded, different to that of man. The food of these pond fish is in part faeces from privies set up over a corner of the pond; but of the snail host which intervenes in the life history between man and fish the information is at present unsatisfactory though the matter is being followed; there were in the mud of all these ponds *Bithynia longicornis*, and in that of some *Parafossalurus striatulus*; on crushing 190 of the former no *Clonorchis* cercariae were seen and in 470 of the latter one only. Propaganda and means of prevention are considered and the names of the 40 intermediate hosts and of the workers by whom they have been incriminated are listed.

C. L.

ROBERT (J.). Considérations sur quelques cas de distomatose hépatique à *Clonorchis sinensis* chez des Chinois de la Côte-Est de Madagascar. [*Clonorchiasis among Chinese in Madagascar*.]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 208-211.

In Madagascar the hawkers are Chinese and Robert reports 7 of them with *Clonorchis* infection, of whom 2 died and were submitted to necropsy. Their symptoms were those of hepatic congestion and a severe anaemia with effusions. *Clonorchis* eggs were seen in

the stools of all, and this is the only intestinal parasite mentioned. The possibility of the local spread of the infection is raised but not answered.

C. L.

BIGGART (J. H.). **Human Infestation with *Fasciola hepatica*.**—*Jl. Path. & Bact.* 1937. Mar. Vol. 44. No. 2. pp. 488-489. With 2 figs. on 1 plate.

A woman who had never left Scotland and who was in the Springfield Asylum, Cupar, Fife, for acute melancholia died from a retropharyngeal abscess, and in her bile ducts were found about a dozen flukes 2.5 cm. long, 1.3 cm. wide and having "the gross and microscopic characters of *Fasciola hepatica*." The liver weighed 36 oz., was hard, fibrous, with dilated bile ducts, the glands of the mucosa being often 1 mm. or more long, and the stroma round them infiltrated with eosinophil and plasma cells. In the liver parenchyma was marked biliary cirrhosis eosinophil filtration and many new bile ducts.

C. L.

CHEN (H. T.). Quelques observations sur un cycle évolutif de *Paragonimus* dans le sud de la Chine. [On the Development of *Paragonimus*.]—*Ann. Parasit. Humaine et Comparée.* 1937. Mar. 1. Vol. 15. No. 2. pp. 155-161. With 5 figs.

In the mollusc *Assiminea lutea* [this *Bulletin*, CHEN, 1937, Vol. 34, p. 17] the development has been followed naturally and experimentally. The number of sporocysts in one snail varies from 1 to 9, they are whitish with dark striae, are easily got from the lymphatic system by dissection, are generally ellipsoidal when young and elongated when old, and contain not more than 26 rediae of the first generation; the mean measurements of 9 rediae were 0.369×0.202 mm.; they make their appearance about the 26th day. Within them are formed rediae of the second generation, a figure showing 16 of them on the 38th day. As to cercariae, they swarm round joints of the legs of *Sesarma* crabs (*vide loc. cit.*) but penetration has not been seen, though failing this within 15 minutes they encyst on carapace or legs, an observation believed to be new.

C. L.

RODRIGUEZ-MOLINA (Rafael) & HOFFMAN (William A.). **The Concomitance of *Endamoeba histolytica* and *Hymenolepis nana*.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. Mar. Vol. 12. No. 3. pp. 295-299. [Spanish version pp. 300-305.]

A mulatto of 22 harboured *H. nana*, *N. americanus*, *T. trichiura*, *E. histolytica* and *G. lamblia*, and had diarrhoea and tenesmus but no blood in the stools.

Emetine hydrochloride gave some relief to the symptoms, yaten caused amoebae and practically all symptoms to disappear, but intermittent diarrhoea went on. On 7 occasions male fern was given. After the first 6 of these treatments 22,493 *H. nana* were identified, after the seventh a conservative estimate by volume put the number as 441,000 more; but the infection persisted and attacks of diarrhoea came on when there were many oncospheres in the stool. It is suggested that a concomitant amoebic infection favoured a heavy autoinfection. Oil of chenopodium was not given, it being held from experience that amoebiasis contraindicated it.

C. L.

GRAHAM (H. Boyd). **Hydatid Disease in Children.**—*Med. Jl. Australia.* 1937. Feb. 6. 24th Year. Vol. 1. No. 6. pp. 206-214.

A survey of the children admitted to the Children's Hospital, Melbourne, since 1900.

For the 3 complete and the fourth incomplete decades the yearly averages of admission for hydatid infection have been 7.4, 3.6, 2.8 and 2.2, and in these 151 children the sites of cysts have been: liver 87, lung 37, liver and lung, brain, abdominal wall each 6; peritoneum and kidney each 2; pelvis, femur, rib, spine and orbit each 1. In more detail are given the 74 children who came under the author's own care. The distribution of the cysts is given by age, and it is seen that multiple cysts in the liver are common in them—9 of 40 children in whom the liver alone was infected, the liver being also implicated in 22 in whom there were cysts in the lung. Suppuration has been commoner than expected, arising from rupture of the cyst. Daughter cysts were present in 12 children and before labelling a cyst as sterile a scraping from its inner surface should be looked at under the microscope for scolices; the formation of daughter cysts is considered as coming into being when the scolices in the mother cyst are threatened with destruction by suppuration, new ones formed in daughter cysts being safer from death. The growth of one child was interfered with, but when the cysts were taken away she more than doubled her weight in a few months (27 to 58 lbs.). The intradermal test has been of great value but owing to lack of standardization it is felt the author's case records do not add anything of scientific value. Complement fixation was apt to rise greatly after operation and to persist for some months; and its extent before operation was evidently a measure of the amount of antigen which has escaped from the cyst. Prognosis is good even after rupture and suppuration, provided the child is over 4; two of the nine deaths were in those under this age. Of the others the cyst in one was in the kidney and was large with a severe operation; two were in the liver, one child having congenital syphilis, the other a tuberculous hip joint; three were in the brain, the cyst not being removed in two and being of long standing with severe pressure in the third; the ninth was in the spine necessitating laminectomy. The features of the cysts in special localities are illustrated by case records.

C. L.

KNEEBONE (J. Le M.). **Hydatid Disease: a Survey of Sixty Cases.**—*Med. Jl. Australia.* 1937. Feb. 6. 24th Year. Vol. 1. No. 6. pp. 201-206.

"There were six deaths. Three patients died from sepsis occurring in liver hydatid; two of them died unoperated on and with the condition undiagnosed. One patient with a pulmonary hydatid cyst died from pneumococcal meningitis a week after removal and closure of a cyst which had been complicated by pleurisy some weeks previously. A second died of tuberculous meningitis while still unoperated on, but this patient cannot be included as dying from hydatid disease. One patient with liver hydatid and secondary peritoneal echinococcosis died after numerous operations. One patient with hydatid of the liver died of pulmonary embolism three weeks after operation.

"Of the remaining 53 patients, one is still awaiting operation. The others have been operated on and are well at present or have died from other diseases. The majority of those who are alive are probably cured, but several will doubtless need operations for secondary cysts in the future."

C. L.

SENEVET (G.), WITAS (P.) & LIÈVRE (H.). L'épidémiologie du kyste hydatique en Algérie. [Prevalence of Hydatid in Algeria].—Ve Congrès Annuel de la Federation des Sciences Médicales d'Algérie, de Tunisie et du Maroc (Oran, 10–13 avril 1935).—19 pp.

In Algeria there have been reported 1,896 hydatid infections in man among 4,792,418 inhabitants, the habitat percentages being liver 67, spleen 3, lung 13, peritoneum 4, other organs 13. In animals killed in 3 abattoirs the percentage of infection in not less than 50,000 sheep in each place have been—for liver 6, 10 and 9 and for lung 6, 16 and 10; the corresponding figures for oxen are 11, 15 and 13, and 12, 17 and 12. As to the strobiles in dogs the percentages of infection in two series have been 6 and 12.

C. L.

WYDRIN (A.). Ein Fall von Herzchinococcus.—*Wien. Klin. Woch.* 1937. July 30. Vol. 50. No. 30. pp. 1135–1137. [10 refs.]

REPETTO (Roberto L.). Hidatidosis costal.—*Prensa Méd. Argentina.* 1937. May 26. Vol. 24. No. 21. pp. 1052–1083. With 12 figs. [56 refs.]

PENFOLD (W. J.), PENFOLD (H. Boyd) & PHILLIPS (Mary). *Taenia saginata*: Its Growth and Propagation.—*Jl. Helminthology.* 1937. Jan. Vol. 15. No. 1. pp. 41–48.

The points considered are the length, colour, rate of growth, full number of segments, number of eggs in a ripe segment, and life span of *T. saginata*.

The report is based on 200 specimens. When contracted the length was from 9 to 20 feet, when relaxed from 15 feet (700 segments) to 32 feet (950 segments), though the latter when touched contracted to 10 feet. The colour was usually a light cream with mature segments often yellow especially at their edges. In one patient, they were always grey. Leuckart's occasional green margins the authors have never seen. The mean rate of growth is believed to be 8 or 9 segments a day, the estimates of other workers being considered. The number of segments in a complete worm is usually 800 to 900, their smallest and greatest numbers being 700 and 950 when, as usual, the anterior ones had been counted by a low-powered microscope. As to life span, it is believed to be usually as long as the host lives, though they know of one instance of spontaneous cure. The mean numbers of oncospheres estimated by dilution counting of those expelled by manipulation and by examination of the segment after this is in the order of 80,000 (5,000 to 130,000). The mean number of these passed daily is then about 720,000. In the author's first 83 patients, there had been a mean duration of infection of 13 years and a mean of $2\frac{1}{2}$ worms on a total of 8,000 million eggs passed by each patient while infected [and infection of man being relatively so rare, this is some suggestion of the chances against any oncosphere growing into an adult worm.]

C. L.

MAPLESTONE (P. A.). The Eggs of *Taenia solium* and *Taenia saginata*.—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 149–151.

"The statement by Southwell (1930) that the eggs of *T. solium* and *T. saginata* are indistinguishable has been shown to be correct, and a study

of the literature has revealed an excellent example of the all too common habit that authors have of taking a statement from older publications and copying it year after year without it being put to the proof of correctness."

In examination of the literature the author notes that several have stated that the two can be distinguished by stool examination when only eggs were seen. C. L.

SCHAPIRO (Mark M.). **A Quantitative Study of Egg Production in *Taenia saginata*.**—*Jl. Parasitology*. 1937. Feb. Vol. 23. No. 1. pp. 104-105.

Schapiro counted the eggs in 4 terminal gravid segments from 4 *T. saginata* preserved in 70 per cent. alcohol. These were dissected in 10 per cent. glycerin-alcohol mixture and the freed uteri gently teased to liberate ova. These ova were counted by the drop method, and in what was left of the segments when those had been made into press preparations. The mean was 123,810 (115,956 to 131,664). Accepting COBBOLD's estimate of 400 gravid segments a month there are in that number 37,143,000 eggs at any one time. The theoretical possibilities of infection of man are given. C. L.

Ryo (Sai). **A New Anthelmintic "Raigan" in Taeniasis.**—*Jl. Oriental Med.* 1937. Apr. Vol. 26. No. 4. [In Japanese pp. 799-845. [64 refs.] English summary p. 62.]

The author has been investigating old Chinese drugs and comparing the results of their employment with those used in modern medicine. *Omphalia lapidescens*, known as "Raigan," a fungus growing where bamboo flourishes, has been used for at least two thousand years in China for infestations by *Taenia*, *Ascaris* and *Enterobius*. The author tested the crude drug powdered, giving 20 grains three times a day for four days in four cases of *T. solium* infestation, sixteen of *T. saginata*, the same number of *H. nana*, two of *H. diminuta*, and five of *D. caninum*. It proved most successful with all of these. He found it ineffectual in nematode infestations, by *Ancylostoma*, *Ascaris*, *Trichuris* or *Enterobius*; it is selective for Cestodes. H. H. S.

PENFOLD (W. J.) & PENFOLD (H. B.). ***Cysticercosis bovis* and its Prevention.**—*Jl. Helminthology*. 1937. Jan. Vol. 15. No. 1. pp. 37-40.

A further report [see PENFOLD, PENFOLD & PHILLIPS, this *Bulletin*, 1937, Vol. 34, p. 22] on acquired immunity of cattle to infection with *Cysticercus bovis*, and its bearing on the prevention of infection of man by *Taenia saginata*.

These cattle were fed on ground on to which the Melbourne sewage had been run (for which reason cattle fed there may not be used for human consumption) and as controls of local infectibility 24 oxen were fed on onchospheres of *T. saginata* and all became infected. Seven other cattle were fed with 400,000 of these onchospheres and after 54 and 70 weeks and 23 months, two, two and three of them respectively were fed with eggs which had infected all other cattle so treated; yet, none of these seven got infections which the writer's experience enabled them to put down to this second infection. In the same way 20 oxen grazed on such a sewage farm for 4 years, and then drenched with 400,000 onchospheres each showed no second

infections. An immunity had come about. The eggs so used were only 2 days old and had it seems been kept in saline in a refrigerator at $+2^{\circ}\text{C}$.
C. L.

URECHIA (C. I.). Sur quelques cas de cysticercoose du système nerveux. [**Cysticercosis of the Central Nervous System.**]*—Bull. Acad. Méd. Roumanie.* 1937. 2nd Year. Vol. 3. No. 1. pp. 19–33. With 12 figs.

A detailed report of 6 mental or epileptic persons with cysticerci in the brain or spinal cord.
C. L.

ALEXANDER (A. J. P.). **Epilepsy and Cysticercosis.***—Brit. Med. Jl.* 1937. May 8. pp. 966–967.

In this case a radiogram of the chest, taken because there were signs of tuberculosis at the right apex with tubercle bacilli in the sputum, showed puzzling small calcifications in the neck. Further radiograms of abdomen and thighs showed, as is well seen in the figure, several dozen elongated shadows of cysticerci. The man served in the army in Egypt and India. "Cases of this nature are undoubtedly a great rarity."
C. L.

MINCHIN (R. L. Haviland). **Cysticercosis as a Cause of Epilepsy in a Diabetic Indian.***—Lancet.* 1937. Apr. 10. pp. 865–867. With 2 figs.

"A case is described of epilepsy in a diabetic Indian due to infestation of the brain with *Cysticercus cellulosae*. This is the first noted in an Indian."
C. L.

Tso (Chun-Te). **Intraocular Cysticercosis.***—Chinese Med. Jl.* 1937. Apr. Vol. 51. No. 4. pp. 545–548. [14 refs.]

The cysticercus with its sucker and hooks could be clearly seen in active movement with the ophthalmoscope, though the figures of it mentioned in the text are not bound in the copy received. The man often ate pork and had had a tapeworm. There were no subcutaneous nodules or fits.
C. L.

MISCELLANEOUS.

ANIGSTEIN (Ludwik). **Medical Exploration in Liberia.**—*Bull. Health Organisation. League of Nations.* Geneva. 1937. Feb. Vol. 6. No. 1. pp. 93-127. With 24 figs. on 11 plates and 1 folding map. [23 refs.]

———. Résultats de l'exploration sanitaire et médicale entreprise en 1935-1936 dans la république de Libéria.—*Bull. Office Internat. d'Hyg. Publique.* 1937. May. Vol. 29. No. 5. pp. 946-952.

Three expeditions have been made by Anigstein in Liberia. An account of the third was published in this *Bulletin*, 1937, Vol. 34, p. 431. Here we have a comprehensive article giving the results of all three journeys, the object of which was to study the distribution and incidence of endemic diseases, especially in the interior.

He visited the coastal plains, the rolling country of the hinterland, and the mountains on the Guinea border. An account is given of the geography and history of the country, the anthropology and ethnology, the climate and health conditions. The principal diseases are those generally met with on the West Coast—malaria, yellow fever, yaws, leprosy, smallpox, sleeping sickness, and tropical ulcer.

Malaria.—It was difficult to obtain blood samples but in respect of 4,195 children the spleen was palpated. In 33 of 51 localities the spleen rate exceeded 50 per cent. and the parasite rate averaged 46 per cent., in all cases *P. falciparum*; no gametocytes were seen. In spite of these hyperendemic conditions the physical state of the people was excellent and the author contrasts their state with the cachectic patients he has seen in Siam and elsewhere.

Yellow fever.—No endemic focus was found. Of 20 blood samples taken from three different localities two were positive to protection tests. Of 97 blood samples obtained by RICE and HARLEY in 1932, six were positive. This rate is low compared with the West African colonies, British and French.

Yaws.—Of 9,493 adults examined 2,552, or 26 per cent., had tertiary symptoms. Topographical differences are noted and the disease was found to be more common in men than in women in all the tribes. **Sleeping sickness.**—Sporadic cases or small foci were noted. **Filariasis.**—Blood examination on any large scale was impracticable. Elephantiasis was found in 20 of 14,000 natives. **Tropical ulcer** was very prevalent and **goitre** was endemic on high ground.

A "Liberian Health Service" was created in 1932. It consists of a Director of Public Health, 11 European doctors, 3 of whom practise in Monrovia and the rest are missionaries, and 5 Liberians who practise as doctors though not adequately trained. The hospital in the capital is directed by a herbalist. In the whole country there are 150 hospital beds, of which 100 belong to the missions. There is no health service at the ports but, fortunately, owing to the bar at Monrovia and elsewhere, there is no direct contact between ships and shore.

The difficulties in the organization of a health service arise from lack of doctors and scarcity of funds. The public health allocation is 20,000 dollars, 4,000 of which go to the Monrovia hospital. A health service similar to that of Sierra Leone would "absorb the whole Liberian budget." Suggestions are made to improve matters, among them the importance of training an auxiliary health staff which would instil health notions into the tribes,

A. G. Bagshawe,

CLASTRIER (J.). Contribution à l'étude de la pathologie de l'Aurès (Algérie). [Diseases seen in Aurès, Algeria.]—*Arch. Inst. Pasteur d'Algérie*. 1936. Dec. Vol. 14. No. 4. pp. 449-557. With 17 figs. (2 maps) & 18 plates. [21 refs.]

This long paper, freely illustrated with excellent photographs, consists of three parts. The first treats of the country, its climate, the housing, habits, and customs of the people, their local migrations, their diet; in the second are described the diseases met with, and in the third the natural history of the region.

In February 1935, at the instance of the Health Organisation of the League of Nations, the Pasteur Institute of Algeria undertook an enquiry into the curative and preventive action of quinine and certain synthetic drugs in regard to malaria and established a station in the valley of Oued el Abiodh, where the author spent 14 months. The mountainous massif called Aurès is situated in the south of the Department of Constantine; owing to the difficulties of communication it is isolated and the valley of the Oued el Abiodh is the least known part. The population of the area dealt with here is 2,021. The account of the pathology of the valley is based on this 14 months' out-patient practice, supplemented by enquiries.

Malaria is the chief disease and is endemic; in a 1933 epidemic almost all the babies perished. Tables give four indices, splenic, splenometric [*i.e.*, "relative hypertrophy of the spleen"], plasmodic and gametic, with actual figures as well as percentages for subjects above and below 15 years. For children the indices were 44.4, 152, 9.2, and 3 [the significance of the second figure is not stated, the others are percentages]. Of the parasites 65.7 per cent. were *falciparum*, 21.1 *vivax*, and 12.7 *malariae*.

A. hispaniola is found breeding after the rains in shallow, sandy pools invaded by filamentous algae. In the marshy bed of the river are found *A. maculipennis*. *A. marleri* occurred in clear rocky pools but are shown not to contribute to the malaria. The breeding grounds of these and other mosquitoes are described in much detail.

Tuberculosis.—To estimate the extent of this infection the author used von Pirquet's reaction with the technique of Parrot and Foley: 694 subjects were examined, only 17 below 12 months of age. The index for children (up to 15) was 55.5 and for children and adults 74 per cent. This, the author remarks, is very high for Algeria. Clinical signs of the infection are rare. Pulmonary tuberculosis was only once seen.

Relapsing fever.—No epidemic was observed but in the routine blood examination for malaria spirochaetes were seen 4 times. Only one of the subjects had fever. Lice are generally harboured.

Syphilis is about as frequent as in other groups of N. African natives. A primary sore was seen only once. Gummata and nasal perforations were "legion." Aortitis was common, especially among women. Of manifestations of congenital syphilis osteoarticular forms were most frequent.

Ophthalmia and Eye Affections.—For a month the eyes of all persons who came under examination were systematically inspected. The author gives tables and graphs of the trachomatous findings and sums up thus:—Trachoma is extremely widespread (76 per cent. of persons examined). It is relatively benign for out of 240 infected 58.6 per cent. had lesions which evolved without complications. From the age of

5 children are infected in the proportion of 59.3 per cent., but the lesions disappear in 6.2 per cent. (1 in 16). Among 316 subjects there were found only 7 cases of trichiasis, 2 of traumatic pannus and no true pannus; *i.e.*, 2.8 per cent. had these sequelae. In an epidemic of summer conjunctivitis the bacillus of Weeks was usually found (34 times in 61 cases).

Ringworm.—Of 321 children under 16, 26 had ringworm, and more boys than girls (14 per cent. and 5 per cent.); in 21 cases it was favus, in 5 trichophytic. The author concludes that circumscribed forms are commoner than in other regions of N. Africa, that symptoms are slight and that spontaneous cure may occur early.

Leishmaniasis.—One case of Oriental sore, microscopically confirmed, was seen in a shepherd boy who had never left the region. Nine species of *Phlebotomus* were found by PARROT among specimens collected here.

Intestinal Parasites.—Owing to the almost insuperable objections of the natives few stools could be examined. Of those of 47 children 38 contained *A. lumbricoides*.

Among other affections one notes that three children, aged 3, 5 and 14, died of scorpion sting. The most dangerous species is *Prionurus australis*.

No cases of dysentery were seen though the river serves both as sewer and source of drinking water.

Native methods of treatment of all the diseases described receive full attention.

A. G. Bagshawe.

MORALES OTERO (P.), PEREZ (Manuel A.), RAMIREZ SANTOS (R.), ESPINO (Rafaela), RAMÓ (Adriana), FUSTER (J. L.), GONZÁLEZ (Dolores) & MARRERO (Mario). **Health and Socio-Economic Studies in Puerto Rico. I. Health and Socio-Economic Conditions on a Sugar Cane Plantation.**—*Puerto Rico J. of Public Health & Trop. Med.* 1937. June. Vol. 12. No. 4. pp. 405-490. With 8 figs. & 1 map. [Spanish version pp. 491-498.]

This is a long article dealing with a large number of subjects. The objects of the investigation were to ascertain the health and socio-economic conditions of the people living at Central Lafayette when it was acquired by the Puerto Rico Reconstruction Administration, regarding this as an index of rural conditions in the island, especially among those engaged in the sugar-cane industry. The data were obtained by visits to every house by sanitary inspectors, trained nurses and social workers; if any sick were found the doctor was called in. The sanitary inspectors recorded the condition of the dwelling and its environs; the social worker recorded facts regarding education, religion, occupation, weekly earnings, and information was collected even on such purely personal matters as the character of the furniture, the food consumed, the income and how it was spent, whether there were debts and so on.

Following is part of the authors' summary:—

"1. The area surveyed is a middle-sized, absentee-owned sugar cane plantation situated in the south-eastern part of Puerto Rico.

"2. The area includes 16.1 per cent. of the rural population of the municipalities of Arroyo, Patillas and Maunabo, in which the plantation is located. The population . . . is very stable, predominantly colored . . .

"3. Most of the houses are wooden, and roofed with galvanized iron. Nearly three-fifths of the houses have from 100 to 299 sq. ft. of floor area

and approximately one-half of them have from one to four exterior doors or windows. Half of the houses are property of the families living in them and two-fifths are property of the Central. The average number of rooms per dwelling is 2.5. More than half of the population live in houses of only two rooms. About one-third of the families have water piped to the house and the rest use water from shallow wells, rivers and streams, and rain water. Forty-three per cent. of the houses do not have sanitary conveniences of any kind; about one-half of them have latrines and nearly 5 per cent. have water-closet installations

"5. The most prevalent diseases are malaria, gastro-intestinal disorders and tuberculosis. The highest mortality recorded in the three municipalities is from the above-mentioned causes. In Arroyo and Patillas the mortality from malaria is more than double the average mortality for Puerto Rico from the same cause.

"6. More than three-fifths of the sick persons found in the area were not receiving medical care of any kind.

"7. The malaria problem is the most serious health problem. Of the cases found, 90 per cent. were malaria cases, four-fifths of which were healthy carriers. Nearly four-fifths of the persons examined harbored parasites of one kind or another in their intestines. Of these, 38 per cent. had a mixed infestation and 46 per cent. were positive for uncinaria. A few advanced cases of tuberculosis were found and nearly three-fifths of the persons tested reacted positively to the tuberculin test. Eight per cent. of the samples taken for syphilis gave a positive result.

"8. The family constitutes the labour unit dependent upon the Central for its existence. Three-fifths of the families are composed of five members or less; the average size of families is 5.1 members

"9. The consensual marriages include 26.6 per cent. of the population 15 years of age and older, and 46.6 per cent. of the total married population

"10. Nearly two-fifths of the persons ten years of age and over have never been in school; two-fifths have completed from 1-4 grades in school; 16 per cent. have completed from 5-7 grades and only 4.7 per cent. have completed the eight grades of the elementary school. More than three-fifths of the population with any grade of instruction have been in school only from 1-4 grades . . . More than half of the heads of families (52.3 per cent.) never have been in school and 30 per cent. of them have from 1-4 grades of school.

"11. More than two-fifths (43.5 per cent.) of the persons under 15 years of age are illegitimate. Among children under one year of age the percentage of illegitimacy is 58.2 and 52.2 in children 1-4 years of age.

"12. Of the total number of workers on wages, 80 per cent. are unskilled farm laborers and 20 per cent. skilled and semi-skilled workers. The former work an average of 34.1 weeks and the latter 39.9 weeks during the year. Only 10 per cent. of the farm labourers and 41 per cent. of the skilled workers have work during the whole year

"13. Nearly two-thirds of the expenditures are spent in food and there are budgetary deficiencies fluctuating from 7 to 75 per cent. in all families earning less than \$6 per week.

"14. One-fourth of the families have garden plots and more than four-fifths of them possess property of one kind or another. Similarly, more than four-fifths of the families in the wage-earners' group have accumulated debts, two-thirds of which were incurred for food." H. H. S.

DREOSTI (A. O.). **Pathological Reactions produced by Work in Hot and Humid Environment in the Witwatersrand Gold Mines.**—*South African Jl. Med. Sci.* 1937. Apr. Vol. 2. No. 2. pp. 29-36. [18 refs.] [Summary appears also in *Bulletin of Hygiene.*]

The physiological reactions to work in a hot and humid environment vary greatly in degree in different subjects. During investigations of

the pathological effects of work in such atmospheric conditions several subjects had to be removed from the experimental chambers owing to collapse. These gave a typical picture of cardiac syncope; in no case was there a hyperpyrexial temperature. Many natives appeared to be perfectly happy with a temperature of 104°F. These suffered no cardiac embarrassment, but had inefficient control of rise in body temperature. Hard manual work in hot places may lead to heat collapse (or heat exhaustion or heat syncope) or to heat stroke (or heat-hyperpyrexia, thermic fever, or siriasis).

The symptoms and signs of heat-collapse are those of a fatigued heart, namely, headache, dizziness, general feeling of weakness or collapse. The discomfort due to these symptoms prevents further muscular work, and heat collapse is thus in a sense protective. Debilitated workers are more prone to heat-collapse than normal subjects. The abnormal strain of work in a bad underground environment may, in diseased subjects, bring about complete breakdown in the heart's action with subsequent death.

Heat-stroke is a condition of acute mental excitement with delirium, convulsions, muscular twitchings or tremors, and is always associated with a high body temperature. The causative agent in the body has not been established: hyperpyrexia is only an accompaniment, not the cause. Unlike heat-collapse, heat-stroke only occurs in unacclimatized subjects. The onset and course of the condition are acute, and anticipatory treatment therefore impossible. Heat-stroke is preventable by control of the working environment together with suitable acclimatization.

T. Bedford.

SOLLIER (L. F.) & BOUTAREAU (C.). Un cas de mélioidose à manifestations cliniques prostatato-urinaires. [**Melioidosis with Signs of Prostatitis.**].—*Bull. Soc. Méd.-Chirurg. Indochine*. 1937. Jan. Vol. 15. No. 1. pp. 8-10.

A corporal, 38 years of age, reported sick with a history of feeling fatigued and having had fever for 6 days, his temperature was 39°C. He had been taking quinacrine for some days without benefit. The following day he had retention, necessitating catheterization; there was no pain until two days later when the prostate was swollen and tender on the left side. His temperature then was 40.5°C., Widal reaction was negative to the enteric group, to *Proteus X19*, and W.R. negative. Prostatic abscess formed and was opened and drained, but the patient died next day, six days after reporting sick. Post-mortem revealed congestion of both lungs with miliary abscesses at the left base, enlarged liver and spleen and an abscess at the upper pole of the right kidney. Cultivation had been tried with pus from the prostatic abscess and with blood taken on the day before death; in both cases a pure growth of *Pf. whitmori* was obtained. The source of his infection was not determined.

H. H. S.

CICCHITTO (Angelo M.). Sul "Bigio" [**Bigio.**].—*Policlinico*. Sez. Prat. 1937. Apr. 26. Vol. 44. No. 17. pp. 823-824, 827-830, 833. With 1 fig.

The author gives an account of the clinical signs of Bigio [see this *Bulletin*, 1930, Vol. 27, p. 167, and 1931, Vol. 28, p. 860] and describes two cases. Briefly it is characterized by a superficial ulceration of the

lower lip, semilunar in shape, involving mainly the mucosa, not extending to the deeper layers nor accompanied by enlargement of the lymphatic glands. The condition is, the author states, far from uncommon in Somalia. He finds in these patients hypochromic anaemia and other signs of vitamin deficiency, in particular vitamins A and C. The treatment giving the best results he finds is the local application of Castellani's fuchsin lotion and parenteral administration of liver and suprarenal extract—parenteral because the natives are so heavily infested with helminths that absorption of medicaments is impaired.

H. H. S.

MANDLIK (G. S.). **A Record of Rhinosporidial Polypi with Some Observations on the Mode of Infection.**—*Indian Med. Gaz.* 1937. Mar. Vol. 72. No. 3. pp. 143–147.

Details are given of 48 cases and a consideration of them much facilitated by a carefully compiled table. They comprise those seen between February 1931 and October 1936, and are divided into four groups: i. Poona, the place of infection being the river Mula-Mutha, near Sungum; ii. Manchar, infection a tank west of the city; iii. Satara, three tanks in the city, Mangalwar, Machi, and the municipal tank; iv. Old wells in Oundh and Yelliv.

From a study of the cases no common cause of infection was found, but it was localized to infected water and acquired in bathing and swimming, or diving; but probably mere bathing is not enough, for carters employed on the sand work escape. Floating spores may enter the skin and the closer and longer contact of swimming and diving plays a great part, the latter possibly by driving spores into the nasal mucosa. Many resist infection for years and catarrhal and inflammatory rhinitis are unfavourable to infection, due, it is suggested, to phagocytic action of the cells present.

H. H. S.

KUILMAN (J.), KAISER (P. J.) & SARDJITO (M.). Rhinoscleroma in de Pasoemah-landen. With appendix by A. N. J. Th. à Th. VAN DER HOOP. [**Rhinoscleroma in the Pasoemah Lands.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. Mar. 30. Vol. 77. No. 13. pp. 770–803. With 5 plates & 1 map. [22 refs.] German summary.

Since the existence of rhinoscleroma was first recognized in the Netherlands Indies by SNIJDER and STOLL in 1918, further records of this disfiguring disease have multiplied [see this *Bulletin*, 1935, Vol. 32, pp. 73, 521, and 1936, Vol. 33, p. 720]. It has been suggested that the disease has its chief incidence upon the older indigenous races, as exemplified by the animistic people of the Batak Lands, Bali and Chota Nagpur, the co-called "Munda Folk." In this category may be included the inhabitants of the Pasoemah Lands, who are the subject of the present study. These people, however, although of old stock, are Mohammedans and differ from the others mentioned in having a comparatively high standard of living and sanitation. They, at least, cannot be included among the "great unwashed."

The Pasoemah Lands form a plateau in the South eastern part of Sumatra and have as their chief town Pagar-Alam in the centre. It is an area of 1,600 sq. km., and has a population of about 61,000. A well-arranged survey scheme, in which all officials co-operated,

brought to light ten cases of rhinoscleroma; this is a high proportion, unless the proportion is simply testimony to the efficiency of the search for cases.

One of the features of Pasoemah rhinoscleroma was that the lesions were by no means so extensive or disfiguring as those which have previously been described elsewhere and this is ascribed to the introduction of sanitation. Rhinoscleroma is, in fact, a disease which is dying out.

Laboratory tests were an important part of the investigation scheme, but the workers were at some disadvantage in that the material sent for examination took three days to arrive. Cultures were often rendered useless by the overgrowth of *Proteus* organisms. An interesting test which was applicable clinically and gave indication of its usefulness was the allergic reaction resulting from intracutaneous injection of antigen. This antigen was either a suspension of killed rhinoscleroma organisms or a filtrate of a bouillon culture. The reactions of rhinoscleroma sufferers were significantly greater than in non-sufferers, but it remains to be seen whether they are specific enough to differentiate rhinoscleroma from the diseases due to allied organisms of the capsule bacilli group, *ozaenae* and *Friedländer*. Good clinical photographs and bibliography accompany the article.

An interesting appendix deals with the anthropological question of the incidence of an ancient disease upon an ancient folk but ends with the commentary that "all is still vague and uncertain" in this regard.

W. F. Harvey.

IKEDA (K.). **Bronchopulmonary Moniliasis: its Relation to Obscure Chronic Pulmonary Infection.**—*Arch. Path. Lab. Med.* 1936. Vol. 22. No. 1. pp. 62–81. With 5 figs. [Summarized in *Rev. Applied Mycology*. 1937. Mar. Vol. 16. Pt. 3. p. 177.]

"Since Castellani's observations in 1905 on bronchopulmonary moniliasis among Cingalese tea workers, this condition has been regarded as a clinical entity. In the present study attention is drawn to the existence of an apparent relationship between a pathogenic species of *Monilia* (*M. [Candida] albicans*) and chronic interstitial pneumonia of obscure etiology, associated with bronchiectasis and abscesses. The results of the writer's investigations further suggest a sequential relation of a certain type of chronic bronchial asthma to bronchopulmonary moniliasis, the former representing an early phase of the latter. *C. albicans* may therefore be considered as an important etiological factor in the development of obscure bronchopulmonary infection, but whether it is the sole cause of the disease cannot be stated on the basis of present evidence."

CAVALCANTI (Robalinho) & BICCA (J.). Ainhum. (Caso em um mestiço).—*Hospital*. Rio de Janeiro. 1937. June. Vol. 11. No. 6. pp. 719–730. With 8 figs. [18 refs.] English summary (8 lines).

VAKARURU (Henry B.). **An Undiagnosed Condition which does not yield to Medical Treatment but yields to Fijian Medicine.**—*Native Med. Practitioner*. 1937. Jan. Vol. 2. No. 4. pp. 360–363.

The condition referred to is that of localized heat, swelling, tenderness, and most acute pain, in one patient affecting the dorsum of one foot, in the other two (one of whom was the author himself) the

scapular region. Treatment by sodium salicylate and potassium iodide internally or by injections of N.A.B., and glycerin and belladonna locally gave no relief. The condition seems to be well known to the natives, who call it *gata*, or *balei*, and they use local plants which gave in all these cases speedy relief. The botanical names of the plants are not mentioned; the author states that they are called Walai and Wakurukuru. "The skin of these . . . is peeled off, and the inside parts are then ground and wrapped up in coconut fibre. The whole is then kneaded in cold water which the patient then drinks, leaving a few drops for massaging the affected part." The editor of the journal adds a note saying that the condition is, in his opinion, a form of fibrositis and that the native drugs contain massive doses of salicylate.

H. H. S.

JORDAN (Edwin O.) & BURROWS (William). **The Vomiting Sickness of Jamaica, B.W.I., and its Relation to Akee Poisoning.**—*Amer. J. Hyg.* 1937. May. Vol. 25. No. 3. pp. 520-545. [18 refs.]

Vomiting Sickness is a condition which has been noted in Jamaica for more than half a century and at one time caused so many deaths in a short period, wiping out whole families in a day, that a veritable panic occurred in limited districts where the reviewer was carrying out investigations in 1915. The present article is the most complete which has been published since SCOTT's monograph in 1916, and should be read and studied by all interested in this, one of the most dramatic of food poisonings occurring in warm climates. If still obtainable, SCOTT's original article should be read in conjunction with the present, because many of the points there mentioned and discussed have been studied anew by the authors and carried further by fuller and more complete experimental work. The epidemiological evidence is more fully dealt with in SCOTT's article because he had the advantage of seeing a large number of cases, amounting to hundreds, in the course of some years, but the experimental work of Drs. Jordan and Burrows is much more detailed.

The authors state that the fatal issue occurs "usually within 3 to 4 days"; SCOTT's analysis of over 300 cases placed the average duration at about 12 hours. Another point of which no mention is made is the differences of character between the early and the late vomiting and of the calm interval of apparent recovery between them. Perhaps the authors had few opportunities of watching cases from start to finish. The initial vomiting is of an irritant type—gastric, the later typically cerebral—effortless pumping up of fluid material, from which, in SCOTT's experience, recovery never took place. Hundreds of lives have been saved by prompt treatment at the first onset of vomiting. The authors do not mention the histological fatty changes in the central nervous system.

The authors quote SCOTT regarding the effects of administering "an extract, made by boiling unopened ackees with water." This is correctly quoted, but was badly or misleadingly worded by SCOTT. The latter was testing the ackee as eaten by the people and he prepared the material in the same way as the people, namely, using the arilli; SCOTT meant "an extract, made by boiling the arilli of ackees which had not opened naturally"; he did not test the toxic effect of the husks nor of the seeds, because in preparing the food the people use only the arilli. The authors in their experiments have estimated the toxicity

of these parts also and have thereby done much excellent work in showing the marked toxicity of the seeds.

It is to be hoped that the authors will continue their studies with a view to isolating the toxic principle and evolving a reliable test for it ; and this for two reasons : Firstly, as an interesting scientific discovery ; secondly, because with the present inability of proof by analysis an undetectable method of homicide (and more particularly infanticide) is in the hands of any unscrupulous person. SCOTT's attempts at isolation of the poison failed ; extracts were made with alcohol, ether, and petroleum ether, and alcoholic derivatives seem to have antidotal properties. Watery extracts are highly toxic and some way must be found of preserving these for analysis other than by addition of alcohol. It is noteworthy that the authors are of the opinion that the poison may be a glucoside. SCOTT made the same suggestion, because it appeared to be very unstable, readily decomposed by the gastric juices, and so made its recognition more difficult.

The reviewer calls attention to these points, not by way of cavil, but to urge further research. Those who have seen patients dying in numbers from inadvertently eating this food when in an unfit state, many of them hungry children on the way to school picking up unripe ackees off the ground, will welcome any work tending to clarify a problem of epidemiological and scientific interest, and the authors of the present article have done a great deal of useful and meritorious work to this end.

H. H. S.

YU (K. Y.). **Some Observations on Atriplicism.**—*Jl. Oriental Med.* 1937. May. Vol. 26. No. 5. pp. 63-69. With 5 figs.

In 1898, J. J. MATIGNON described in Northern China, under the designation "Atriplicism," a condition which he believed was due to the ingestion of the shoots of the plant *Atriplex serrata* (*Chenopodium hybridum*), the symptoms being oedema of the face, hands and forearms associated with disturbances of motility, sensibility, circulation and trophic state of the skin of the hands, often complicated by crust formation in the oedematous areas.

Since then a few cases have been described by others and the name has already found its way into one or two text-books.

In 1935, Yu, who had recognized this condition among patients attending the clinic at Mukden, found that in some cases there was a history of ingestion of amaranthus instead of chenopodium and in one case neither had been taken. At the same time he came to the conclusion that the skin manifestations only occurred at such time and at such sites as there had been exposure to strong sun's radiation, thus agreeing with MATIGNON's observation that these cases are seen in May, June and July. Yu now suggests that the ingestion of these plants plays no part and that the condition should be described as a Light Sensitive Dermatitis and the term atriplicism discarded.

Yu cites five cases : a few hours after an exposure to bright sunshine marked oedema of the face and hands occurred including the palm so that the fist could not be closed ; blistering and ecchymosis ensued followed by exfoliation. It was noted that the swollen parts felt cold and the radial pulse very poor. There was giddiness followed by unconsciousness.

[This syndrome is here described as it is in some ways suggestive of pellagra. Yu does not mention pellagra and attributes the condition

to simple sunburn in susceptible individuals. The cause of the susceptibility is not quite obvious and why the condition is not more common is unexplained. His article may, however, serve to draw the attention of others to the affection.]

H. S. Stannus.

STANESCO (Mihail) & ENACHESCO (S. D.). L'érythro-sédimentation dans la pellagre avec des troubles psychiques. [**Red Corpuscle Sedimentation in Pellagrins with Mental Symptoms.**]*—Bull. et Mém. Soc. Méd. Hôp. de Bucarest.* 1936. Nov. Vol. 18. No. 9. pp. 263–265.

The rate of sedimentation of red cells has been tested in a number of diseases and attempts have been made to estimate the clinical significance of departures from the normal. Thus in pneumonia, in acute articular rheumatism the rate is increased, returning to normal with convalescence. In pulmonary tuberculosis it is used for prognostic purposes, an increase being noted in progressing cases, a decrease with arrest.

The authors have examined eight pellagrins in their mental hospital and give the results after half an hour, 1 hour and 24 hours. Whereas in normal patients the fall in the first hour varies between 1 and 7 mm. (the higher rates in women), in these mental pellagrins it ranged between 21 and 74 mm. after 1 hour and 101–120 after 24 hours, a rate approaching that seen in acute pneumonia. The authors maintain that this indicates profound disturbance of the whole system shared by the cutaneous, digestive, circulatory and nervous organs.

H. H. S.

REVIEWS AND NOTICES.

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It is just ten years since the publication of the first edition of this well-known *text-book* of tropical medicine, for such it is rather than what in England we should understand as a *précis*. (The first edition was reviewed in this *Bulletin*, 1927, Vol. 24, p. 858.)

The diseases are arranged according to the organ or system involved, as in the previous edition, but though this leads for example to the divorce of amoebic hepatitis from the section on intestinal amoebiasis any disadvantages which thus accrue have been well met. Each subject is dealt with, as in our own text-books, under sections: definition, history, geographical distribution, epidemiology, aetiology, pathogenic agent, symptomatology, etc.

The present edition is half as large again as the last, of necessity, but it is not overloaded in an attempt to make it "encyclopaedic"; systematic parasitology here finds no place but all the essential facts regarding protozoology, helminthology, etc., in their bearing on tropical medicine are reproduced, making a well balanced very readable book, well worth perusal by the English tropical practitioner in search of a change in reading, or on account of some slight differences in French medical thought.

On the whole the volume is well up to date though here and there omissions may be remarked or some point receives but scanty mention. Thus, the Paralytic Rabies transmitted by Bats in Trinidad and Brazil, HURST and PAWAN, 1931, is omitted; the typhus fevers of Malay receive but short notice; BRAY's work on infantile beriberi might with advantage have been included, as also a more up-to-date discussion upon the relationship of vitamin B₁ and that disease.

Attention is here called to the useful method of giving abbreviated bibliographical references adopted by the authors as worthy of more extended use.

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TUBERCULOSIS IN THE TROPICS

PART II*

THE CONTROL OF TUBERCULOSIS IN THE TROPICS.

By E. COCHRANE, M.D. (Glas.), D.P.H. (Lond.).

Control of Tuberculosis in the Tropics.

In dealing with the control of tuberculosis in the tropics we have to visualize a variety of situations, methods that would be of avail in an urbanized or semi-urbanized community composed of races partly immunized by centuries of exposure, would prove worse than useless in a primitive community in whose midst the disease is beginning to make headway. Further, any methods of prevention must be outlined in relation to the existence of other preventable disease, the tropical sanitarian is beset with so many problems in respect to the prevention of disease that the addition of yet another bids fair to be the straw that broke the camel's back. However, the basis of anti-tuberculosis measures differs in no respect from that for other diseases namely, good housing, correct feeding and sound sanitation. As CROCKET (1933) puts it, tuberculosis is an index disease pointing to the conditions of life and work prevailing in any region. When the death rate for tuberculosis is falling it is proof that sanitation is receiving efficient attention on the part of the responsible authority.

There are some workers who would leave the matter in the hands of the sanitarians, as they are convinced that essential sanitary reforms, even in the absence of specific measures, will suffice to eradicate the malady in time. WINCHESTER (1934) draws attention to the fact that the tuberculosis death rate in the Straits Settlements has steadily diminished since the early years of this century, moreover its decline has been steeper than that of the general death rate. The fall has been most marked in Singapore Island where the percentage of people living under rural conditions is low. He maintains that any anti-tuberculosis measures apart from housing and town planning schemes are of little avail. The process of urbanization will, he thinks, solve the problem by allowing a more complete infection of all the population

* Part I on "A Survey of Tuberculosis in the Tropics" appeared in the October issue, pp. 743-772.

and thus hasten the elimination of the weakly immune. As it has taken the Jews two thousand years to attain this stage it would appear desirable to, at least, attempt to reach it somewhat earlier.

Control of Bovine Tuberculosis in the Tropics.

Before considering the human aspect of the problem it is necessary to mention the need for veterinary prophylaxis. In many colonies, particularly in Africa, a strict watch is being maintained on the incidence of tuberculosis in cattle. That this is essential is shown by the comparatively high rate of infection amongst the cattle in British Guiana, the disease has now been allowed to spread to such an extent that eradication by slaughtering will be an expensive measure. Consistent and wide scale tuberculin testing, even though it may appear expensive, will pay in the end if it eliminates the few infected beasts before the disease commences to spread. Nor should the thorough testing of imported cattle be omitted, since importation of bulls from the United Kingdom is often carried out in order to improve the local breeds. Even where milk is not an article of diet the persistent propaganda of health departments that milk is the perfect food is introducing the milk drinking habit, and to replace malnutrition by bovine tubercle, will not reflect credit on any propagandist. The time is ripe for more attention to be paid to this question, lest it produces another problem for the tropical hygienist.

Control of Tuberculosis in Backward Communities.

Communities are still to be found where ignorance and prejudice prevail to such an extent that any measure of control appears almost impossible of application. The first point to consider is whether tuberculosis exists to any great extent in such a community. The hospital records are not always to be depended on to furnish very accurate returns, in the first place, the rapidly fatal case common in primitive communities never enters hospital; secondly, with a busy out-patient department and crowded wards differential diagnosis is not easy and the diagnosis of bronchitis not infrequently conceals the damage which should be laid to the credit of tuberculosis. The only certain methods of ascertaining, with some degree of accuracy, the amount of tuberculosis present are by tuberculin test and post mortems. The technical difficulties in the way of tuberculin testing have already been discussed and their solution by the adoption of new methods advocated. Local prejudice is less easy of solution, but as long as schools, police forces and jails exist, material will be found for investigation. Where an aversion to the introduction of medicines under the skin is met with Craig's test is especially useful, as the extra O.T. is wiped off and the puncture does not appear to the untrained observer to introduce the material into the body. Actually, in most parts of the tropics, injections are largely demanded by the inhabitants who see in this method of administering medicaments a great improvement on the old-fashioned way of merely swallowing them so that intradermal tests should not arouse any great antipathy.

The acquisition of information through the medium of post mortems is sadly hampered in many parts, especially where the population is of the Mohammedan faith. Routine autopsies are out of the question, but the keen medical officer will always be on the look-out for opportunities furnished by post mortems required to be done in the interests of the law. The records of these can furnish a good deal of information

if they are performed with an eye to general interest as well as the ascertainment of the actual cause of death. Again, a considerable amount of information may be acquired by the use of the X-ray. It is true there are still areas where no X-ray apparatus is available, but these are becoming fewer in number, and time spent on carrying out as large a series of screenings as possible would yield a great deal of valuable information. The correct assessment of the presence or absence of thoracic disease requires practice but experience soon brings a reasonably high standard of proficiency. Nowadays, there are screens on the market which give as clear a picture as one could possibly desire.

Once information has been acquired regarding the amount and type of tuberculosis present measures have to be considered in relation to the control of the disease if it is, or threatens to be, a public health problem of any magnitude. In work of this nature there is only one royal road to success and that is concentration on the family as a unit, not the infected individual alone.

This is especially necessary in communities where the people live in rural or semi-rural conditions. As soon as an open case is detected, every effort should be made to carry out as efficient isolation as may be obtained. Conditions vary so much that it would be foolish to lay down any specified methods, there are places where the disease is regarded with so much horror that the unfortunate sufferer is practically left to care for himself; elsewhere no notice is taken of the condition and the whole family is exposed to intense infection. As far as possible two measures should be enforced, namely, the cleanly disposal of sputum and the placing of the patient in the open air for as many hours of the day as possible, but guarded from the direct rays of the sun. In some cases an ordinary calabash filled with wood ash forms an excellent receptacle for sputum or an issue of old tins containing a small amount of liquid disinfectant will suffice. Where feasible the contacts should be tuberculin tested and screened and the regular issue of a little medicine, especially cod-liver oil, to the children, often suffices to ensure their regular attendance at a hospital out-patient department for a considerable period, thus enabling them to be kept under observation.

In a community such as outlined here, the tuberculosis dispensary can serve no good purpose, its place as a clearing centre can be filled to better purpose by the district hospital. To set up a dispensary before its proper function is appreciated by the population it is intended to serve would merely be a waste of time and money. It resolves itself into keeping up another out-patient department, as those with all and every ailment would go to it for treatment. Once simple anti-tuberculosis measures are set going over a wide area and the inhabitants begin to appreciate their significance then the time is ripe for the first step in organized work, the erection of the tuberculosis dispensary. Nor does this entail considerable expense: the erection of a simple structure with room for expansion is much more desirable than the usual type where limited waiting accommodation aids the spread of infection; here patients, healthy adults and children may have to crowd in together and the dispensary unwittingly becomes the centre for further dissemination of infection. The best type of building is that built well off the ground so that shelter from rain or sun may be obtained under the structure with no restriction on ventilation. It should be in a central position, easy of access, though not on too

commanding a site in order to avoid attracting undesirable publicity. On the other hand, to site such a dispensary in some remote corner on the farther edge of town or village, encourages people to be secretive, and the idea that tuberculosis is something to be ashamed of gains ground.

In the early stages any attempt at introducing treatment requiring regular attendance is likely to meet with failure; the unsophisticated native is at a loss to understand either the nature of the treatment or the need for its repetition. A judicious selection of cases with minimal progressive lesions for treatment by phrenic evulsion is recommended, it only requires a few successes to induce others to come forward. Even in these more backward communities there is always one section that will respond to intelligent propaganda and seek treatment, namely the clerical and administrative subordinate staff and school teachers. If a start can be made by detecting early cases amongst this class and active collapse instituted, the results will attract widespread attention. Patients drawn from this class ensure better results, they are capable of understanding the principles of treatment and their circumstances are such as to permit of rest for a prolonged period and a reasonable standard of nourishment. Such cases amply repay the trouble and care expended on them if they are carefully selected and their progress attentively watched. One demonstration of the efficacy of artificial pneumothorax is worth a score of hygiene talks. Hitherto, in many parts even amongst the educated natives, their attitude has been that tuberculosis is one hundred per cent. fatal and while they may seek advice it is only in the last stages when despair drives them to try medicines, in which they have no real faith. The infiltration of the news amongst the better educated portions of the populace soon extends even to the most ignorant.

Once the desire for treatment is aroused in the minds of the people the question is how to carry out such treatment in circumstances that will make the patient feel at ease and yet will enable the medical man to administer it under optimum conditions. The answer appears to be the setting up of small communities where sufferers may live under conditions resembling their habitual environment and yet permitting of reasonable isolation and continued attention. CUMMINS (1935) describes the work of Swiss missionaries in Portuguese East Africa who have developed a "tuberculosis village" in which the patients are cared for and fed by their own relatives, and yet treated and supervised by medical men who understand them and can fathom their prejudices and anxieties, instilling confidence in them by this appreciation of their mental processes. The huts are inexpensive to construct, and when vacated on account of death or removal can be burnt down.

STONES (1932) discussing the problem of tuberculosis in Uganda suggests that sanatorium treatment will not suit African needs, but village settlements appear to be the solution. The patient, once treatment is successfully under way, could carry on trades as is done in settlements at home, especially such employment as is suited to his needs and training. He quotes the suitability of experimental small-holding schemes of the Uganda Department of Agriculture for such settlements. He puts the matter very aptly when he says "segregation with contentment should be our watchword." The excellent work done by missions in connexion with the maintenance and treatment of lepers might well be extended to village settlements for the tuberculous.

The above measures, elementary though they appear, if energetically carried out should have a decisive effect in checking the extension of the active disease. In no part of the world save, perhaps, amongst a few primitive hill tribes or remote jungle dwellers, will tuberculosis ever sweep through the community as it did among the North American Indians, infection is now too general. KLEINE (1930) commenting on anti-tuberculosis work carried on in Africa, with especial reference to that of WILCOCKS, asserts that any fear of the disease assuming epidemic proportions, even in remote regions of East Africa, is groundless. The slow gradual infection of whole populations that is taking place is a sufficient guarantee against the repetition of the disasters seen in the past.

Control of Tuberculosis in Developing Communities.

As these communities develop and present possibilities of gain to the pioneers of commerce and industry, the problems of defence against tuberculosis become more difficult. One of the most important sources of infection from outside is the entrance of the petty trader, so often one of the Oriental races, who carries with him the organisms of disease readily enough but fails to bestow along with these unwelcome gifts those elements necessary for rapid and effective immunization. This invasion, mainly by Indian and Arab traders, is general throughout Africa. RODHAIN (1928) was of the opinion that the disease was spread in Belgian Congo by Arabs and Baluchi traders as well as by Europeans. Elsewhere the same process has been observed. The writer has had clear evidence of the spread of tuberculosis through an area in British North Borneo, densely populated by a primitive tribe, following the setting up of shops by Chinese traders. In areas where traders are already established in large numbers little can be done in the way of special prevention by forbidding their entry, but in sheltered communities any infiltration by such traders ought to be more strictly controlled by the medical department.

The part that should be played by Government control during this evolutionary process is admirably set out by YOUNG (1934) who, as the result of his experience in West Africa, affirms the theory that equality cannot be present as between immune and non-immune peoples. This lack of resistance clearly renders rapid urbanization a most undesirable process for native races. Young would reverse the usual process of bringing the native to the city by erecting townships in outlying districts. In planning for these, the density of the population would be limited by restricting the number of buildings to be erected on any given area. Moreover, he would place upon industry the burden of housing its workers in decent manner. These two measures would lead to the setting up of small townships extending out into the bush instead of becoming grossly overcrowded at the centre. No industrial concern would be allowed to commence operations until it owned, or obtained an option on, land in its immediate vicinity to supply sufficient accommodation for houses for all its workers and their families. This measure would prevent the setting up of new works in the heart of an already overcrowded town and the enticement of rural dwellers to flock to the town and enter the unhealthy environment associated with urban employment. If groups of industries were established along these lines small townships, limited in size, could be set up which would be sufficiently near the agricultural areas to enable workers to obtain their natural

foodstuffs cheaply and further would not estrange them entirely from their old methods of living.

It is in these gradually evolving communities that survey methods are so necessary; by tuberculin test and fluoroscopy it should be possible to watch the progress of infection and to circumscribe the more dangerous foci of disease. The establishment of a tuberculosis dispensary would be a measure of great practical value, the community has now outgrown the limited resources of the district hospital and its individual members have attained the stage where they may be expected to make intelligent use of such a centre. Along with the erection of a dispensary there arises the problem of providing a specialized medical staff. Once again we are faced with the question of the relative importance of tuberculosis compared with other diseases and the necessity for deciding whether the additional expense of the appointment of a phthisiologist is justified. In the more backward communities the best person to handle the problem is the district medical officer; he has a sound all round knowledge and if necessary should be encouraged to take study leave to make himself *au fait* with the more technical aspects of tuberculosis treatment. In communities where development is proceeding, the health officer, in co-operation with the staff of the district hospital, should be made responsible for anti-tuberculosis measures. One cannot recommend the appointment of specialist officers at this stage, the extra expense is not justifiable; further, most tropical countries have in their service men with post-graduate experience of tuberculosis work. An experienced officer of this kind could be seconded for a time to formulate a plan of campaign and to assist in dealing with special aspects of the task.

There is also the question of a subordinate staff and the problem of obtaining an efficient personnel for such a staff from among the local inhabitants. To expect to be able to produce a highly trained and certificated staff from a community slowly evolving out of a primitive state would be foolish. On the other hand to import such a staff from Europe would be beyond the means of most communities if it were to be devoted entirely to tuberculosis work. It is not necessary to demand a high standard of training for such Health Visitors, in the first place a course of training in the local hospital of sufficient duration to enable them to understand the elementary facts about the treatment and prevention of disease should be arranged. To undergo this training women should be selected who have had a reasonable degree of education, possessed of common sense and of good moral standard. The mission or religious body that cannot produce such women nowadays from amongst its adherents is rare indeed. They need not be capable of solving difficult nursing problems, but they must be able to do hard work, face rebuffs with quiet patience and show a quick sympathy and understanding and unquestioned loyalty. Given these qualities the development of such a woman, of whatever race, into a first-class social worker is a matter of time and largely dependent on the ability of the medical officers to mould her into the desired pattern.

The presence of a dispensary raises the question of hospitalization, and it should be met at this stage by granting accommodation in the general wards of the district hospital to cases fit for collapse therapy, and if possible the erection of a separate ward for advanced cases requiring isolation. The gradual introduction of artificial pneumothorax treatment would probably meet with a reasonable degree of

success, since in a community developing along normal lines there is a greater tendency for the population to become fixed and a lessened desire on the part of the individuals to bolt into the bush when they encounter something they do not understand.

The Control of Tuberculosis in Municipalities and Townships.

In an established and long urbanized community the interested medical officer need search no longer for the existence of tuberculosis, but it is more necessary for him to study the trend of the disease in relation to economic and racial factors. CROCKET (1928) emphasizes this fact when he says that despite the exposure of many successive generations and the improvement in the standard of living in the United Kingdom the incidence of the disease is no less. What has altered is the character of the malady since the rapidly progressive case is less often encountered, but much of the disease is of the concealed or latent variety. The need for careful surveys and examination of all available pathological evidence still continues and should not be neglected, if time is available, simply because routine methods of treatment have been organized along recognized lines and it is felt that there are no new fields to conquer.

In any urban area the establishment of a tuberculosis dispensary should be an accomplished fact, whether the local authorities or Government are responsible for its upkeep. The number of large towns throughout the tropics without any tuberculosis centres is surprising, especially as many are quite capable of undertaking the financial responsibility for such a project. It is more often due to fear of heavy financial commitments than to actual apathy; few realize that a dispensary can be run without any exaggerated expenditure. In urban communities where there is a responsible and well-to-do section, every effort should be made to encourage these better class people to take a share in the work by financial aid and by working on committees in connexion with the dispensary. Nor should the dispensary physician be content to work only at the dispensary: other preventive measures should be encouraged. The routine examination of school-children might well include monthly weigh-ins and those who have lost weight should be examined clinically and by fluoroscopy. HETHERINGTON (1927) states that latent apical tuberculosis of adolescents causes moderate loss of weight in some but not in all cases. As a rule, however, the writer has found that the scales form a good guide, and indicate the necessity or otherwise for further examination. Another method of prevention should be the fluoroscopic examination of school teachers at regular intervals; not only will this aid detection of cases, but it also has definite value as propaganda and interests the teachers in the question of tuberculosis.

In the smaller townships, if such a one is available, a health officer who has held a resident appointment in an up-to-date sanatorium at home should be responsible for the tuberculosis work in addition to his other duties. In many of the large tropical towns the prevention of tuberculosis is rapidly becoming the most important health problem and the appointment of a full-time tuberculosis officer is no longer a luxury, but a necessity. In such areas the required standards for Health Visitors may well be raised and the posts filled by fully trained local nurses, especially those in possession of a Health Visitor's Certificate.

Nor is the simple tuberculosis village alone able to meet the demands of a sophisticated community, the provision of more orthodox institutional treatment has to be considered.

There is no doubt in the minds of most tropical workers that the results of treatment are sufficiently good to justify the provision of tuberculosis institutions. To view the question solely in the light of direct results of active treatment is a mistaken policy. The propaganda effect of modern therapeutic methods is far more important than the end results alone. Nor must we forget the public health aspect of successful treatment lessening the number of infectious cases at large. Especially is this evident in ambulatory A.P. treatment, as by these means we are enabled to deal with those who refuse any but the minimum institutional treatment. FRIMODT-MÖLLER (1926) claims that of 807 patients traced after their discharge from his sanatorium in India after five years 54.5% were still alive. Results such as these indicate that it is wrong to adopt the hopeless attitude so common in the past. If institutional treatment is to be carried out and the necessary resources are available, the erection of a hospital for all types of cases is indicated and not just a sanatorium for early cases.

CROCKET (1934) advocates the establishment of a sanatorium to deal with all stages of the disease, from the hospital for its advanced cases to the labour colony for the convalescent ones. Those are exactly the lines that should be followed in the tropics. To build in one corner a lazaret for the dying and to erect on a different site a sanatorium for those who improve means that the advanced case will never seek hospitalization, unless he is absolutely forced by legal or economic requirements. But if within the same compounds we have all the necessary accommodation for each stage of the disease the sufferer will readily seek admission; even if he is assigned to the advanced wards, he sees about him those who have improved and the hope that it will not be long before he is able to cross the compound into the convalescent wards is ever present with him.

The hospital should be as near to the town as is consistent with ample accommodation and grounds, distance means transport and few natives are sufficiently well off to pay even the few cents required for their regular conveyance to and fro. This means that visits by friends and relatives are limited and furnishes an additional reason for not entering hospital. Even in tropical countries where sites are available in the hills, it appears inadvisable to make use of such sites on account of their distance, except for those able to afford the cost of transport. Suitable accommodation for those able to pay must be provided. PANETH (1934) as a result of his experiences in Java urges the necessity of establishing the principle of patients contributing whatever they can afford.

No tuberculosis hospital is going to get the best results if it can only obtain its cases when they have reached an advanced stage. The best way of obtaining cases in a reasonably early stage, apart from contact work, is by continuous propaganda. The tuberculosis officer must be prepared to speak in season and out of season; to-day in the tropics there are springing up innumerable societies for young men and women and these always welcome health talks. Propaganda amongst school teachers is one that brings the best returns, the teacher holds a very definite position amongst his or her neighbours and his advice is more often sought than may be the case in this country. Pictorial propaganda should be employed extensively, posters, magic lantern slides,

cinematograph shows have all a great appeal. One thing they require however, is local colour, as far as possible they should be prepared on the spot, those from home often fail to impress natives because they portray surroundings unfamiliar to them.

In view of the fact that early and energetic treatment is producing good results, even amongst the less resistant races, it is necessary to consider the question of after-care. CARTER (1926) who had a wide experience of tuberculosis among the negroes of the U.S.A. said that tuberculosis is curable in the negro, but that he is so prone to return to his careless habits and to enter unsuitable occupations that the mortality after leaving the sanatorium is frightfully high. FRIMODT-MÖLLER (1924) at the Union Mission Sanatorium in the Madras Presidency has set up the nucleus of a tuberculosis colony to provide a living for poorer patients who leave the sanatorium in sufficiently good health not to require further treatment, but as yet not fit to earn their living by ordinary means. A small silk farm has been established and the product enables eight patients to earn a sum of money equivalent to what they would gain in ordinary manual employment elsewhere. In order, therefore, to give patients time to be completely restored to health, every effort should be made to establish after-care centres where remunerative and useful employment may be obtained.

The use of B.C.G. has not been stressed in view of the controversy still raging. It has been employed in Mauritius, but no results are available as yet. B.C.G. has been used in the French colonies since 1925 with apparently very satisfactory results. TOULLEC (1932) furnishes results from Dakar where the mortality among vaccinated infants has fallen from 25% to 10%, whereas no appreciable decline has been noted in the unvaccinated groups.

The place of legislation in the anti-tuberculosis scheme requires careful consideration and MATTHEWS (1935) has summed it up in a sentence that every tuberculosis worker would do well to commit to memory "When a native thinks his disease can be cured or materially eased by medical aid, no law will be required to make him seek it." The usefulness of legislation has been discussed in Part II, and the writer adheres to his view that it is a useful weapon to have in reserve, but it should be employed only as a last resource.

There are still many parts of the tropics where the native denied the treatment necessary for the arrest of tuberculosis would, if he but knew them, echo in his heartfelt manner those well-known sentences of Trudeau who recounts in his autobiography something of his feelings on being told that he had pulmonary tuberculosis. "Black despair filled my heart, I think I know something of the feelings of the man at the Bar who is told he is to be hanged on a given date, for in those days pulmonary consumption was considered as absolutely fatal."

To-day much is being done to remove that feeling of hopelessness still present in less fortunate lands. BLANCHARD (1935) outlining the measures employed in French West Africa says that expansion of facilities for hospitalization and treatment is being actively pursued in all the French colonies.

Much more has yet to be accomplished; DE LANGEN and LICHTENSTEIN (1936) write "Tuberculosis must come to form the most important problem of all tropical countries before very long. It is amazing to see with what degree of apathy the increase of tuberculosis is being regarded in East Asia. Millions are being spent annually for the

eradication of leprosy, while for the fight against tuberculosis a few paltry thousands have with difficulty been raised. The mortality statistics of the Philippine Islands over the ten years ending 1930 show the relative importance of these two diseases to the community in a most striking way; out of every thousand inhabitants 54.1 died in the course of ten years from tuberculosis; 0.27 died of leprosy. The mortality from tuberculosis was, therefore, just over 200 times as high as that from leprosy; the difference in morbidity may well be left to the imagination! The time will come, and that right soon, when this ostrich like policy will have to be set aside, and the terrible scourge that is threatening the East be met face to face."

British Guiana is a small country situated right in the tropical belt, it has scanty financial resources despite its potentialities and is largely populated by a race peculiarly susceptible to tuberculosis. Yet to-day it can boast of having an active and efficient organization to deal with the menace of tuberculosis and a mortality rate from that disease (0.8 per 1,000) which many a greater and richer tropical region might well envy. What has been done there may be accomplished elsewhere.

To conclude, the words of HOEBEKE (1934) are a timely reminder of the duty the great Colonial Powers owe to their native peoples. "Nous avons combattu avec acharnement le pian, la syphilis, la trypanosomiase, la malaria, la fièvre jaune, que nous considérons comme des maladies exotiques. La tuberculose, vieille connaissance d'Europe, ne nous a pas émus. Elle a pourtant tout lieu et droit de nous émouvoir. Elle a aussi sa petite allure exotique. Il est temps de s'en préoccuper."

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BLACKWATER FEVER.

FOY (Henry) & KONDI (Athena). **Blackwater Fever in Macedonia.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 123–138. With 6 figs.

During 5 years work in Greece some 450 cases of blackwater fever have been seen and investigated in the laboratory, and some 900 made available for statistical analysis. In this paper the authors have outlined a brief general summary of their findings.

A full statistical analysis is now in the course of preparation and will be published later. The following summary is given :—

" (1) A brief outline is given of some epidemiological findings regarding blackwater fever in Macedonia, a full report of which will be published later.

" (2) Large numbers of cases of blackwater fever occur in Greece, probably not unrelated to the immigration of refugees from areas in Asia Minor where malaria was either absent or of negligible importance.

" (3) Regression equations were calculated to define any relationship that existed between malaria and blackwater fever in M_0 , M_1 and M_2 years, with the result that a definite correlation was found to exist between the number of malaria cases in any year and the number of blackwater fever cases in the same year, *in an already sensitized population*.

" (4) No correlation was established between the number of blackwater fever cases and the malaria cases occurring either 1 year or 2 years previously.

" (5) No correlation existed between malaria and blackwater fever in an *unsensitized* population, no matter how severe the malaria.

" (6) The susceptibility of the populations of Macedonia to blackwater fever has been steadily rising during the last 14 years, although somewhat irregularly. Susceptibility as measured by the ratio $\frac{B}{M}$ may in future tend to oscillate about an upper limiting value, instead of increasing irregularly as it has done in the past.

" (7) The seasonal lag between the malaria and blackwater fever peaks is established ; and the correlation found to be 0.93 when the blackwater fever peak is shifted forward two months.

" (8) Blackwater fever appears to occur in a period that lies between an apparent malaria cure and relapse, as indicated by the seasonal distribution of malaria and blackwater fever, and the malaria relapse season in Macedonia.

" (9) 40 per cent. of the cases of blackwater fever were found to be positive for malaria ; 47 per cent. *falciparum*, 33 per cent. *vivax*, 14 per cent. mixed *falciparum* and *vivax*, 6 per cent. pigmented. This should not be taken to imply that *falciparum* is a 'more potent producer' of blackwater fever than *vivax*, since *falciparum* is about $1\frac{1}{2}$ times more prevalent among the general population of Macedonia than is *vivax*. But parasite rates in blackwater fever should not be taken to have any great significance unless the following are known :—

" (i) Time and amount of quinine taken prior to first passage of blackwater.

" (ii) Magnitude and duration of the haemolytic process as measured by red blood cell counts, and bilirubin levels.

" (iii) Time elapsed between first passage of black urine and taking blood film.

" (10) Charts and tables are given showing age distribution, sex ratio, death rates, family incidence, frequency of attack, etc."

W. Yorke.

FOY (Henry) & KONDI (Athena). **Researches on Blackwater Fever in Greece. IV.—Experimental Investigations into the Existence of Haemolytic Strains of Malaria and/or Other Specific Parasites in Blackwater Fever.**—*Ann. Trop. Med. & Parasit.* 1936. Dec. 23. Vol. 30. No. 4. pp. 423–433.

This work was undertaken with the object of examining the question whether there existed haemolytic strains of malaria or other specific parasites associated with the genesis of blackwater fever.

The experiments consisted in a series of blood inoculations into general paralytics and other mental patients, and in feeding on them mosquitoes infected from blackwater fever cases.

The inoculation of malaria-positive and negative blood, withdrawn at various periods after the first passage of haemoglobinuria from 58 cases of blackwater fever into 106 mental patients, failed in every case to produce haemoglobinuria. Similarly, anophelines of the species *elutus*, *superpictus* and *maculipennis*, infected from 35 cases of blackwater fever, and subsequently fed on 68 cases of general paralysis, failed to produce blackwater fever. It is noted that all the cases were kept under observation for from 9 to 18 months after their blood inoculation or mosquito infection.

The authors state that this work would seem to limit the field of argument for the existence of haemolytic strains of malaria or other specific parasites concerned in the genesis of blackwater fever.

W. Y.

FOY (Henry) & KONDI (Athena). **Three Cases of Blackwater Fever following the Oral Administration of Atebrin.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 99–102.

The authors encountered three cases in which blackwater fever supervened either during or after treatment of malaria with normal standard doses of atebrin. None of these had taken quinine up to within 2 to 9 months before the onset of their haemoglobinuria, so that quinine can be excluded as having taken part in the precipitation of the attack of blackwater.

Details of these cases are given. In two of them the onset of blackwater fever occurred on the 1st and 3rd days after a full course of atebrin (1·5 gm. spread over 5 days); in the third case haemoglobinuria appeared in a boy of 5 years on the 4th day of treatment, after he had received 0·7 gm. of atebrin.

It is interesting to note that in Cases 2 and 3 the haemoglobinuria occurred at a time the blood was devoid of parasites, as was shown by examinations of thick films of peripheral blood and by spleen puncture. These observations throw doubt on the hypothesis that the onset of blackwater is associated with the sudden destruction of large numbers of parasites (MANSON-BAHR, 1924; and BLACKLOCK & MACDONALD, 1928) and to support the view expressed by the reviewer and his colleagues (1930).

The authors state that these observations indicate that atebrin, like quinine and plasmoquine, is capable of precipitating blackwater in certain patients, but whether these drugs are all equally potent in this respect remains to be determined. [To the reviewer's mind it seems highly probable that any drug of value in the treatment of malaria

may be liable to precipitate an attack of blackwater, and that the reason why quinine is notorious in this respect is that this drug is employed on an immensely greater scale than any other compound.]

W. Y.

ALEXANDRIDES (Karl). Ueber die Ätiologie und Pathogenese des Schwarzwasserfiebers. [**The Aetiology and Pathogenesis of Blackwater Fever.**—*Arch. f. Schiffs- u. Trop. Hyg.* 1937. July. Vol. 41. No. 7. pp. 505-512. [48 refs.]]

After defining blackwater fever the author points out that haemoglobinuria is only one sign of the disease. Haemoglobinuria can, of course, be produced by many causes, some of which are exogenous and some endogenous. Amongst the former are animal poisons (snake venom), vegetable poisons (fabism), various chemical substances, and various infective conditions; among the latter are burns, frost bite, march haemoglobinuria, and pregnancy.

Three chief theories have been advanced to explain the aetiology of blackwater fever—(1) that it is due to quinine; (2) that it is due to a special form of malaria; and (3) that it is a special disease. Each of these theories is discussed in turn. The first is dismissed because blackwater fever occurred in the time of Hippocrates, long before quinine was known, and because blackwater fever has followed the administration to malaria cases of many drugs and notably in recent times of atebirin and plasmoquin. [This line of argument does not seem to the reviewer to be very sound.]

The second theory is likewise dismissed for various reasons, amongst which are the observations of FOY and KONDI on the inoculation of blackwater fever blood into general paralytics [*vide above*]. The third theory, according to which blackwater fever is a disease *sui generis*, met with, however, only in persons who have suffered from malaria, seems to the author to be the most probable. Possibly the unknown factor is a special spirochaete, the malaria preparing the ground for this infection by bringing about a dysfunction of the reticulo-endothelial system. [This paper does not carry us much further.] W. Y.

WERNER (H.). Ueber Schwarzwasserfieber und seine Ueberwindung durch Chininvermeidung. Ersatz durch Plasmochin und Atebrin und ueber das Anurieproblem. [**Blackwater Fever and its Surmounting by the Avoidance of Quinine. Substitution by Plasmoquine and Atebrin, and on the Anuria Problem.**—*Deut. Med. Woch.* 1937. Feb. 12. Vol. 63. No. 7. pp. 270-271.]

A semi-popular article which contains nothing new. The author stresses the importance of blackwater fever as a cause of death among the white population in malaria regions. The rôle which quinine plays in the production of blackwater fever is so well-known and so scientifically proved, and it is so equally certain that pure plasmoquine and atebirin do not belong to the group of drugs which produce blackwater, that one can lay down.—“Do not treat malaria with quinine and you will certainly avoid blackwater fever.” [This *ex cathedra* statement, like the title of the paper, reminds one of advertisements for patent medicines. Does the author imagine that the case for these remarkable drugs is strengthened by such grotesque hyperbole?] W. Y.

CONDOYANNIS (N. D.). Ueber die Ätiologie des Schwarzwasserfiebers. [**The Aetiology of Blackwater Fever.**]—*Deut. Med. Woch.* 1937. Aug. 6. Vol. 63. No. 32. pp. 1219-1221.

This article is of a speculative nature ; it contains nothing new and must be read in the original by those interested. W. Y.

DE HARTOGH (L. F. S.). Diagnostische en klinische bijzonderheden bij febris biliosa haemoglobinurica.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1937. July 6. Vol. 77. No. 27. pp. 1622-1634. With 3 charts. English summary.

MIN SEIN. **A Case of Haemoglobinuria caused by Plasmochin taken as a Prophylactic against Malaria.**—*Indian Med. Gaz.* 1937. Feb. Vol. 72. No. 2. pp. 86-87.

Details are given of a patient who developed haemoglobinuria whilst taking plasmoquine daily as a prophylactic against malaria.

The patient was one of a party of men engaged on a flag march in the jungle in Tharrawaddy district in Lower Burma, between the 31st October and 5th November, 1932. Each man was given 0.04 gm. of plasmoquine daily as a prophylactic. At the end of the fourth day's march (3rd November) the patient reported sick, and on the 5th November he was admitted to hospital. There was no previous history of malaria, the spleen was not enlarged, the blood was negative, the pulse was weak and thready, the evening temperature was 100°F., and there was general abdominal discomfort without nausea or vomiting. On admission to hospital the patient was found to be remarkably jaundiced and in a state of collapse with cold and cyanosed extremities. On questioning, it was elicited that he had passed dark-coloured urine since the 3rd November. The condition gradually improved and the patient was discharged as cured on the 30th November.

The author states there seems to be no record in the literature of haemoglobinuria following the administration of plasmoquine as a prophylactic. W. Y.

ATTLEE (W. H. W.). **Haemoglobinuria following Exertion.**—*Lancet.* 1937. June 12. p. 1400.

This paper contains notes of two cases of haemoglobinuria in public school boys, who were in the habit of playing strenuous school games and running long distances on grass, without symptoms, but attacks followed immediately after running on hard roads. Details of each case are given.

The author states that it seems unlikely that this curious sequence of events can be nothing more than a coincidence, but it is difficult to see the connexion. Neither patient had marked lordosis, and there seems no reason to think that running on roads should induce a more lordotic posture than running on grass. It is not known whether the pigment was blood haemoglobin or muscle haemoglobin, and neither patient had any symptoms other than haemoglobinuria.

W. Y.

BRULÉ (M.), HILLEMAND (P.) & GAUBE (R.). Deux cas d'hémoglobinurie paroxystique. Les difficultés du diagnostic clinique et hématologique. [**Two Cases of Paroxysmal Haemoglobinuria.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*. 1937. Feb. 22. 53rd Year. 3rd Ser. No. 6. pp. 197-205. [10 refs.]

Two cases of paroxysmal haemoglobinuria are described in considerable detail: this is justified on the ground of the difficulty in making a clinical diagnosis. On the first two occasions on which the first case was seen the patient exhibited signs of jaundice which did not present the usual features of haemolytic jaundice. The patient was taken into hospital and a laparotomy performed, but no indication of biliary obstruction was found: it was only later, when a careful examination of the blood was made that a positive Donath and Landsteiner's reaction disclosed the correct diagnosis. The second case had been under medical observation since 1925 for a haematuric nephritis associated with antecedent malaria; in this case also a positive Donath and Landsteiner's reaction revealed the true nature of the case.

W. Y.

PIÉRI (J.), SARDOU & BATTESTI. Hémoglobinurie paroxystique. [**Paroxysmal Haemoglobinuria.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 154-158.

An account is given of a case of Raynaud's disease with paroxysmal haemoglobinuria. There was no history of syphilis, and the Wassermann reaction was negative; similarly, there was no history of malaria, the blood was negative, as also was Henry's reaction. The note contains nothing of special interest.

W. Y.

FAIRLEY (N. Hamilton). **A New Blood Pigment: Pseudo-Methaemoglobin.** [Correspondence.]—*Nature*. 1937. Apr. 3. Vol. 139. No. 3518. p. 588.

— & BROMFIELD (R. J.). **Pseudo-Methaemoglobin in Blackwater Fever and its Clinical Significance.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 139-170. With 1 chart. [22 refs.]

In addition to oxyhaemoglobin, methaemoglobin has been recorded in the plasma of blackwater fever patients by ARKWRIGHT and LEPPER (1918), YORKE, MURGATROYD and OWEN (1930), ROSS (1932), and Fairley and Bromfield (1934). [As a matter of fact, both these pigments had been observed in the plasma of blackwater fever patients by BARRATT and YORKE as long ago as 1909.]

In 1934 Fairley and Bromfield recorded a new pigment closely allied to methaemoglobin in a patient desperately ill with blackwater fever [this *Bulletin*, 1935, Vol. 32, p. 210]. About a year later, the same pigment, which is now called pseudo-methaemoglobin, was again encountered.

The present paper discusses the authors' findings in Macedonia during November and December, 1936. The following summary of their observations is given:—

"1. A new pigment which we have named 'pseudo-methaemoglobin' has been constantly demonstrated in the plasma of severe cases of blackwater fever. In the past, this pigment has been erroneously regarded as methaemoglobin by all observers.

" 2. Certain spectroscopical and chemical reactions suitable for the routine differentiations of pseudo-methaemoglobin, methaemoglobin and sulphaemoglobin are described.

" 3. Pseudo-methaemoglobin produces a brown plasma, is never found within the corpuscles and is formed from oxyhaemoglobin only after its liberation from the red cells. It cannot function as a respiratory pigment.

" 4. The new pigment never appears in the urine in demonstrable quantities, nor is it destroyed by incubation at 37°C. with sterile urine for 24 hours.

" 5. Methaemoglobinuria is common in blackwater fever, but the methaemoglobin is derived from oxyhaemoglobin in the tubules or bladder and not as a result of methaemoglobinaemia.

" 6. The formation of pseudo-methaemoglobin evidently constitutes a stage in a process by which the body disposes of circulating extra-corpuscular blood pigment; in consequence the appearance of pseudo-methaemoglobin is to be anticipated in any intravascular haemolysis of sufficient magnitude.

" 7. The conversion of free oxyhaemoglobin into pseudo-methaemoglobin or any product impermeable to the kidneys is entirely beneficial since the amount of haemoglobin available for excretion in the urine is decreased and the tendency to renal damage lessened.

" 8. Pseudo-methaemoglobin can be artificially produced by incubating a concentrated solution of oxyhaemoglobin at 37° to 50°C. for 24 to 48 hours in the presence of a sufficient quantity of sterile plasma.

" 9. Similarly, when an artificially produced solution of methaemoglobin or sulphaemoglobin is incubated with sterile plasma at 40°C. for 24 to 28 hours pseudo-methaemoglobin is produced.

" 10. Pseudo-methaemoglobin may also be produced *in vitro* by some constituent in the plasma reacting with alkaline solutions of pure haemin or haematin.

" 11. Since globin is presumably absent from both these substances as well as from plasma, the suggestion is made that pseudo-methaemoglobin is formed by a combination of haeme or haematin with some nitrogenous constituent of the plasma other than globin.

" 12. When pseudo-methaemoglobin is reduced by sodium hydro-sulphite a haemochromogen is formed which differs spectroscopically from globin-haemochromogen."

An appendix contains case histories of the Macedonian cases.

This interesting and important Address was followed by a discussion in which a considerable number of members took part. W. Y.

CAIN (André), CATTAN (Roger), HARRISPE (Jean-Vincent) & VAN DER BOIJEN (Gérard Bouwens). Anémie hémolytique ictérogène avec hémoglobininurie nocturne et hémosidérinurie permanente. [*Haemolytic Anaemia and Icterus with Nocturnal Haemoglobinuria and Permanent Haemosiderinuria.*—*Bull. et. Mém. Soc. Méd. Hôpit. de Paris.* 1937. Feb. 1. 52nd Year. 3rd. Ser. No. 3. pp. 70-84. [17 refs.]

In 1908, CHAUFFARD and TROISIER reported a case of haemolytic icterus with haemoglobinuria continuing in a paroxysmal manner: the anaemia was extreme, the fragility of the red cells slight, and there were numerous reticulocytes. Somewhat similar cases were subsequently reported by VAN DEN BERGH, MARCHIAFAVA, ROSENTHAL, HAMBURGER and BERNSTEIN, and others. In all, 24 such cases have now been recorded. The present authors give in great detail an account of a 25th case.

The patient was a woman of 37 years of age, who had suffered for seven years from an intense anaemia with haemolytic icterus,

associated with slight nocturnal haemoglobinuria and continuous loss of iron in the urine. The syndrome was not influenced by hepato-therapy or splenectomy; blood transfusion and the administration of iron were harmful rather than beneficial. The authors draw attention to the principal features of this interesting case:—

1. *The anaemia syndrome*.—The anaemia was intense and chronic. During the period the patient was under observation (since January, 1934) the red cell count had never exceeded 2,360,000, and on one occasion had actually fallen to 590,000. It was a hyperchromic anaemia, the value ranging between 1 and 1.72, with an average of 1.3. It was also megalocytic, the red cells varying in diameter from 11 to 15 μ , and there was polychromatophilia, anisocytosis, and sometimes Jolly bodies were present. Megaloblasts were never found, but normoblasts were seen in varying numbers. The leucocyte count varied from 4,000 to 1,000, and there was an excess of mononuclears. There was no glossitis, the gastric juice was normal, and there were no nervous symptoms. Prolonged hepatotherapy was useless and the only result appeared to have been a marked eosinophilia. This fact, in association with the permanent reticulocytosis, seemed to prove that the bone marrow was capable of responding.

2. *Icterus*.—This varied greatly in intensity from time to time. The urine always contained urobilin, but bile pigments were never found. This syndrome of haemolytic jaundice was completed clinically by splenomegaly.

3. *Haemoglobinuria*.—This constituted the third major symptom of the disease. From the beginning it was noticed that after each transfusion there was a pronounced haemoglobinuric crisis. This had been noted by MARCHIAFAVA and the earlier writers in their cases. Similar haemoglobinuric attacks were observed after the administration of protoxalate of iron, but exposure to cold had no effect, and the Donath-Landsteiner reaction was negative. The haemoglobinuria was accompanied by a haemoglobinaemia. Apart from these haemoglobinuric crises, traces of haemoglobin were constantly present in the urine passed during the night.

4. *Haemosiderinuria*.—This sign, which had been noted by MARCHIAFAVA, was constantly observed in the present case.

5. *The prolonged course* of the disease is worthy of note. In spite of the extreme anaemia the patient still remained capable of a certain degree of activity; she only attended hospital as an out-patient and managed to do light work. All previous authors have drawn attention to this fact, and in general the patients have died from some inter-current trouble or as the result of splenectomy.

The paper ends with a theoretical discussion regarding the pathology of the disease and its mechanism; apparently little or nothing is known about it.

W. Y.

THE TYPHUS GROUP OF FEVERS.

ZINSSER (Hans). **The Rickettsia Diseases. Varieties, Epidemiology and Geographical Distribution.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 430–463. With 4 figs. (maps). [140 refs.]

A very able review of the whole subject of the Rickettsia diseases of man; with a full bibliography.

The diseases are divided into three main groups: (1) spotted fever group; (2) tsutsugamushi fever group; (3) typhus fever group. Each group and the various members of the groups are discussed and are displayed in tabular form and the geographical distributions are clearly shown in a series of maps. The Weil-Felix reaction is discussed and vaccination so far as it has been worked out. *D. Harvey.*

DYER (R. E.). **Diseases of the Typhus Group in North America.**—*Canadian Public Health Jl.* 1937. Jan. Vol. 28. No. 1. pp. 1–9. With 5 figs.

This paper is a study of endemic typhus and Rocky Mountain fever, and was read at the meeting of the laboratory section of the Canadian Public Health Association on December 22nd, 1936, in Toronto.

The main points emphasized were that there had been a marked increase in the number of cases of endemic typhus in the Southern States; in 1923 there were 50 cases and in 1933, 1,922. Originally most of the cases had occurred in the coastal towns, but had later spread to rural areas. It is suggested that this spread may be due to infection of other rodents than rats, such as squirrels, rabbits, etc.

Rocky Mountain fever has been known to occur in the Rockies for more than 50 years, but during the last 10 years has been met with over the entire country except the States of Michigan and Wisconsin. It has also been reported in Canada and in Brazil. *D. H.*

DIAS (Emmanuel) & MARTINS (Amílcar Vianna). Aspectos do typho exanthematico em Minas Geraes. [**Typhus Fever in Minas Geraes.**]—*Brasil-Medico.* 1937. Apr. 3. Vol. 51. No. 14. pp. 431–441. With 1 chart.

Thirteen cases form the basis of the authors' remarks. Of the total, 11 were adults, 2 were children, the ages ranging between 6 months and 60 years, the duration of disease between 5 and 14 days; in one patient only was the disease mild, twelve were severe and nine died. Agglutination tests were carried out with nine strains of *Proteus*, with varying results. The clinical course, transmission by tick (*Amblyomma cajennense*), the serological findings indicate a close connexion with Rocky Mountain fever and the São Paulo type. The dog was found to be a reservoir host. No primary *tache* was seen; in a certain proportion of guineapigs inoculated Rickettsia were observed in the peritoneal cells. *H. H. S.*

MOREIRA (João Affonso) & DE MAGALHÃES (Octavio). Typho exanthematico de Minas Geraes. (8a comunicação.) [**Exanthematic Typhus at Minas Geraes.**]—*Brasil-Medico.* 1937. May 22. Vol. 51. No. 21. pp. 583–584.

Three clinical types are met with: ambulant, severe, and fulminating, and the severe cases have high fever, nervous phenomena

and widespread rash. The infection is commonly spread by *Amblyomma cajennense* or its nymphs, less often by *Cimex lectularius*, and possibly by *Rhipicephalus sanguineus*. The following animals have been found infected in nature: the opossum (*Didelphys marsupialis*), the house dog (*Canis familiaris*), wild dog (Cachorro do matto, *C. brasiliensis*), the rabbit (*Sivillagus minensis*), *Cavia aprea* and, less certain, the agouti (*Dasyprocta azarae*). The serum of patients agglutinates *Proteus OX19* and *P. OX2* strongly, *P. OXK* weakly. The fever is closely allied to Rocky Mountain spotted fever. *H. H. S.*

DIAS (Emmanuel), MARTINS Amilcar V.) & RIBEIRO (Domingos J.). Typho exanthematico no oeste de Minas Geraes. Reacções de Weil-Felix positivas obtidas com o sôro de comunicantes e de cães. [**Exanthematic Typhus in Western Minas Geraes.**—*Brasil-Medico*. 1937. June 12. Vol. 51. No. 24. pp. 651-655. English summary.]

During the past three years cases of endemic typhus have been seen in the municipality of Pitangui, western Minas Geraes, but in houses widely separated, perhaps as much as a mile apart. They occurred in the cold, dry months when ticks are common, *Amblyomma cajennense*. One of these was caught and found infective. The serum of patients and of some of the local dogs gave a positive Weil-Felix; one of the former in a dilution of 1 in 160 with *Proteus OXL*, and another with *Proteus HX19* and dogs to the same titre. It is thought that the dog is the local reservoir host, since a specimen of the same tick obtained on one of these animals was found infective and the animal's serum gave a positive Weil-Felix reaction. *H. H. S.*

VON DER BORCH (R.). **Non-Epidemic Typhus: a Report on Fourteen Cases occurring on the Goldfields, Wau, Mandated Territory of New Guinea, between January 1, 1935, and June 30, 1936.**—*Med. Jl. Australia*. 1937. Mar. 20. 24th Year. Vol. 1. No. 12. pp. 435-439. With 6 figs.

Fourteen cases of a severe typhus-like fever are described; all these cases showed a very definite primary sore. The cases were all in white people and occurred among those working at clearing the bush, chiefly on the banks of creeks.

The incubation period was probably 10 days, onset sudden, with headache. Later the cases became typically typhus-like and very toxic, with stupor and low muttering delirium; two of the patients died. A macular rash was noted in all the cases.

The suspected vector is a Trombicular mite known locally as "the mocca." The Weil-Felix reaction was positive for *Proteus OXK*, negative for *OX19* [see paper by GUNTHER below, p. 851]. *D. H.*

DURIEUX (C.), RIVOALEN (A.) & MATHIS (Maurice). Premiers cas de typhus bénin diagnostiques à Dakar. [**First Cases of Benign Typhus diagnosed in Dakar.**—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 124-128.]

Five cases of endemic typhus are described; the Weil-Felix reaction was positive in dilutions of 1/2,000 to 1/5,000 for *Proteus OX19*, a rash was not observed in any of the cases.

Rats were very numerous in the houses in which the cases occurred and a typhus virus was isolated from some of these rats. Blood was taken from one of the patients and inoculated into guineapigs; this inoculation was followed by fever but there was no orchitis.

D. H.

DURIEUX (C.) & ARQUIÉ (E.). Le typhus endémique au Sénégal. Étude du virus isolé de l'homme. [**Endemic Typhus in Senegal.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 343–347.

Six more cases of endemic typhus are reported in Senegal, making 11 in all. These cases had fever for about 14 days and also a typical macular rash with a strong positive Weil-Felix reaction for *Proteus OX19*.

Two strains of the virus were isolated from the blood of the patients. This virus produced fever and orchitis in guineapigs and later these animals were shown to be immune to a known typhus virus. Since the above paper was written another case has been met with. This case was fatal.

D. H.

MODINOS (P.) & VASSILIADIS (P.). Description d'un cas de typhus murin à Alexandrie. [**Description of a Case of Endemic Typhus in Alexandria.**]—*Bull. Soc. Path. Exot.* 1936. Dec. 9. Vol. 29. No. 10. pp. 1047–1052.

The patient was a man, aged 60, employed in a cotton store in the docks. He had fever, with intense headache; on the fourth day a rash developed and later became a typical typhus rash. The fever ceased on the 14th day. The Weil-Felix reaction was positive in 1/1,600 with *Proteus OX19*. There were no other cases in the family. Guineapigs were infected with blood taken from the patient during the fever. Fever and orchitis was noted. Thirty-one rats were captured in the store and their blood tested, but none showed a positive Weil-Felix reaction. The brains of 20 of the rats were emulsified and injected into a guineapig, this developed fever and was later proved to be immune to a human virus.

D. H.

RUIZ (Calonge) & DE LANDAZURI (Ortiz). **Fièvre boutonneuse in Spain and its Experimental Transmission by Ticks. A Preliminary Note.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 539–540. With 1 map and 3 figs. on 1 plate.

During the last few years 80 cases of boutonneuse fever have been studied in hospital in Madrid.

The blood from cases was taken during the fever and inoculated into two patients suffering from nervous diseases; both developed typical attacks of the fever. Ticks were collected from dogs in houses where cases had occurred. These were emulsified and the emulsion inoculated into a volunteer; a typical attack of boutonneuse fever followed.

D. H.

BANERJI (R. N.). A Case of Tick Typhus at Allahabad.—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 297–298.

BREINL (Friedrich), with **CHROBOK** (Eugen). Die Erreger des Fleckfiebers und des Felsengebirgsfiebers. [**The Viruses of Typhus and of Rocky Mountain Fever.**—*Zent. f. Bakt.* I. Abt. Orig. 1937. Jan. 15. Vol. 138. No. 3/4. pp. 129–137. With 3 figs.]

Previous work on tissue culture of typhus viruses by the writers and others is referred to. The method of culture employed in the present research was to infect the tissues of normal guineapigs by immersion in an emulsion of infected brain and spleen, the small pieces of tissues were then placed in special flasks containing fluid media consisting of 1 part normal guineapig serum and 2 parts Tyrode solution. The cultures were then incubated at 37°C. for 7 days and then subcultured. Small pieces of the tissue were removed and placed in fresh media and the remainder of the old culture was used for inoculation of guineapigs and rabbits. The cultures were proved to be virulent by the production of fever in guineapigs and a positive Weil-Felix reaction in rabbits.

The strain of typhus virus used was subcultured successfully 19 times and the strain of spotted fever virus 16 times. Rickettsia could be readily demonstrated in the cultures after the 4th passage in the case of the typhus strain and the 6th in that of Rocky Mountain fever. Changes were made in the normal tissue used; tunica, muscle fibre, brain, spleen, etc., and the sera of man, horse, cattle, pig and rabbit were all utilized and the results are set out in tabular form. The best results as regards the multiplication of Rickettsia were obtained when the tunica tissue of a normal guineapig and the serum of normal guineapigs were utilized. Tissue and serum from immune guineapigs was also tested and it was found that these do not hinder the multiplication of Rickettsia in the culture, but on the other hand in the cultures in which immune sera were used agglutination of the Rickettsia was noted.

D. H.

BRIGHAM (George D.). **A Strain of Endemic Typhus Fever isolated from a Field Mouse.**—*Public Health Rep.* 1937. May 21. Vol. 52. No. 21. pp. 659–660.

In Alabama it has been noted recently that endemic typhus has spread from the towns to the country districts and cases have occurred where the rat was "a highly improbable causative factor."

In view of this fact, investigations have been proceeding to determine what species of native rodents are susceptible to typhus virus and might possibly serve as reservoirs of the disease.

A field mouse was trapped on rural premises in Alabama. Its brain was removed and half of it was injected intraperitoneally into each of two guineapigs. Both guineapigs developed fever and the strain was established. Ninety guineapigs have been used and of these 77 gave a typical fever with scrotal enlargement, 6 fever and slight swelling and 2 fever only. Crossed immunity experiments with a known virus were positive.

D. H.

BRIGHAM (George D.). **Susceptibility of Animals to Endemic Typhus Fever.**—*Public Health Rep.* 1937. May 21. Vol. 52. No. 21. pp. 660–662.

Three field mice were inoculated with the local (Wilmington) virus of endemic typhus; all three became infected. A cotton mouse and

a golden mouse were also susceptible; and three species of wild rats were also infected. A cat was also infected and suffered from fever. The virus was recovered from its blood on the 7th day and from the brain on the 14th day. Eight racoons were inoculated with the virus, but none became infected. *D. H.*

SPARROW-GERMA (Hélène). Endémie typhique sur la population murine de Tunis. Aptitudes vaccinales d'un virus murin isolé à Tunis. [**Endemic Typhus Virus in Tunisian Rats.**—*Bull. Office Internat. d'Hyg. Publique.* 1937. Apr. Vol. 29. No. 4. pp. 719-729.

During a period of three years some 1,000 rats and 300 mice were examined in the port of Tunis and three strains of typhus virus were isolated from the rats and two strains from mice. The reactions of rat typhus virus No. 1 of Tunis have already been fully described in previous papers; the strains isolated from the mice gave similar reactions. About 5 per cent. of the sera of the rats examined gave positive Weil-Felix reactions. It is obvious that the infection among the rats of the port of Tunis is widespread, yet during the three years over which the investigation extended, only one case of typhus in man was met with; on the other hand cases of infection in the laboratory among people who handled infected tissues were common. *D. H.*

- i. BALTAZARD (M.). Typhus murin expérimental; voies d'introduction et réceptivité. [**Experiments with the Virus of Rat Typhus. Routes of Introduction and Receptivity.**—*C. R. Soc. Biol.* 1937. Vol. 124. No. 5. pp. 425-427.
- ii. BLANC (Georges) & BALTAZARD (M.). Action de la bile sur le virus du typhus murin. [**Action of Bile on the Rat Typhus Virus.**—*C. R. Soc. Biol.* 1937. Vol. 124. No. 5. pp. 428-429.

i. 0.3 cc. of virus diluted 1/250 was inoculated intradermally into four men; 48 hours later a local reaction developed, followed by fever and all four men had typical attacks of endemic typhus. The same amount of virus diluted 1/2,000 was inoculated in the same way, with a like result.

ii. Bile treated vaccine produces no reaction in man, but if inoculated intraperitoneally into guineapigs produces fever, and if inoculated intradermally no reaction or fever follows. *D. H.*

VIOLLE (H.). Contribution à l'étude du virus exanthématique murin, en particulier chez le lapin. Sa persistance dans l'organisme de cet animal. Son importance éventuelle dans la préparation de vaccins. [**The Virus of Murine Typhus in the Rabbit.**—*Bull. Acad. Méd.* 1937. May 18. 101st Year. 3rd Ser. Vol. 117. No. 19. pp. 543-548. With 2 figs.

Two rabbits were inoculated intraperitoneally, one with the infected brain of a rat and the other with the brain of a guineapig; both became infected and had slight fever, but no other symptom. The two rabbits were killed two months later and brain emulsion was inoculated into two rats and two guineapigs. Both the rats developed fever; one recovered. In the other the temperature dropped suddenly to 24°C. and the animal died. When passaged in other rats the same curious effect on the heat centre was noted and most of the

animals died in hypo-thermia. The guineapigs had only slight fever and no orchitis; apparently the virulence of this virus was increased for rats but decreased for guineapigs by passage through the rabbit. However, when the strain was further passaged in rabbits the virulence for rabbits was increased, but was decreased for rats. The authors suggest that as they have shown that the virus remains alive for at least a month in the brain of the rabbit, this animal might be utilized for the preservation of the virus and also for the production of vaccine instead of the guineapig. *D. H.*

BLANC (Georges) & BALTAZARD (M.). L'influence du jeûne sur la persistance du virus du typhus murin chez la puce *Xenopsylla cheopis*. [**Effect of Starvation on the Virus of Murine Typhus in Fleas.**—*C. R. Acad. Sci.* 1937. Mar. 15. Vol. 204. No. 11. pp. 919-920.

If fleas are fed on an infected rat and then starved they will not infect a guineapig, but after a second feed they become infective; a feed of blood is necessary for the multiplication of the *Rickettsia* in the intestine of the flea. Once infective fleas remain so, even if starved over long periods. *D. H.*

BLANC (Georges) & BALTAZARD (M.). Longue conservation à sec du virus du typhus murin dans les déjections des puces infectées. [**Viability of Murine Typhus in Dejecta of Infected Fleas.**—*C. R. Acad. Sci.* 1937. Mar. 31. Vol. 204. No. 13. pp. 1046-1048.

The authors found that the virus of murine typhus is viable in the faeces of infected fleas for 21 days; the faeces were preserved on paper in a Petri dish in the dark at room temperature. In dried fleas the virus was viable up to the 7th day and for the same period in rapidly dried faeces. The authors emphasize the danger of the spread of the disease by means of dried faeces of infected fleas. *D. H.*

STARZYK (Jan). Vitalité, toxicité et pouvoir d'immunisation de *Rickettsia prowazeki* conservées hors de l'organisme du pou, en milieu liquide et en milieu sec. [**Vitality, Toxicity and Immunizing Power of *Rickettsia prowazeki* preserved outside of the Body of the Louse in Liquid and Dry Media.**—*C. R. Soc. Biol.* 1936. Vol. 123. No. 36. pp. 1221-1225.

The virus remains alive for some hours outside of the lice in normal saline solution and for some days in human serum.

In dried lice faeces the virus was still alive after 66 days, and in dried lice intestines for 54 days. *D. H.*

SPARROW (Hélène). Un cas de typhus murin chez l'homme à Tunis. Etude du virus. [**Human Infection by Murine Typhus.**—*Arch. Inst. Pasteur de Tunis.* 1937. Mar. Vol. 26. No. 1. pp. 151-155.

A man employed in a grain store in Tunis developed fever, typhus was suspected and the Weil-Felix reaction was found to be positive in a titre of 1/1600. Blood was taken from the patient on the 10th day of fever and after some difficulty the virus was isolated in rats

and was passed by intraperitoneal injection of the brain emulsion from rat to rat and rat to guineapig. This virus produced fever in the rats and fever and orchitis in guineapigs.

The virus protected against rat virus No. 1 of Tunis and also against a historical or epidemic typhus virus; an interesting point is that although a typhus virus had been readily isolated from rats in Tunis, this is the first occasion when the virus was isolated from man.

D. H.

ARLO (J.) & FORTIN. Un cas de typhus murin observé à Marseille. [**A Case of Murine Typhus in a Man at Marseilles.**—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 216-219.]

A young soldier, who was employed in a grain store in which there were numerous rats, contracted endemic typhus. He had severe headache and a profuse typhus rash which involved the palms of the hands but not the face; no *tache noire* could be detected, the man was not in contact with dogs, also the case occurred in the season of the year when ticks are not to be found.

The Weil-Felix reaction was positive in a dilution of 1/1,500 during convalescence. The blood of the patient was inoculated into a guineapig and produced fever and orchitis.

D. H.

PIJPER (Adrianus). Etude expérimentale comparée de la fièvre boutonneuse et de la tick-bite-fever. [**Boutonneuse Fever and Tick-bite Fever Compared.**—*Arch. Inst. Pasteur de Tunis.* 1936. Nov. Vol. 25. No. 3 & 4. pp. 388-401. With 10 figs. [29 refs.]

The clinical, epidemiological and serological differences between the two diseases are stressed.

The present paper deals with the results of crossed immunity experiments. The virus of boutonneuse fever was obtained from *Rhipicephalus* ticks sent from Tunis by air to Pretoria. The virus was successfully isolated from the 3rd batch of ticks received. Two strains of tick bite fever virus were used and 1 strain of typhus (South African). The results are given in tabular form.

Guineapigs	1st inoculation Virus	2nd inoculation Virus	Results
6	F.B.	T.B.F.	No immunity
7	T.B.F.	F.B.	" "
9	F.B.	T.S.A. louse	" "
6	T.S.A. louse	F.B.	3 G.P.'s. no immunity
			2 " immunity
			1 G.P. " feeble
	T.S.A. louse	T.B.F.	Immunity
	T.B.F.	T.S.A. louse	No immunity

F.B. = Virus of boutonneuse fever.

T.B.F. = Virus of tick-bite fever.

T.S.A. = Virus of typhus (South African louse borne).

There was no crossed immunity between the viruses of tick-bite fever and boutonneuse fever nor did the virus of boutonneuse fever protect from the virus of South African typhus, but the virus of South African typhus showed some evidence of protection against the virus of boutonneuse fever.

D. H.

GUNTHER (Carl E. M.). **The Serology of Sixteen Cases of Endemic Typhus in New Guinea.**—*Med. Jl. Australia.* 1937. Mar. 20. 24th Year. Vol. 1. No. 12. pp. 439–440.

This paper refers to the cases described above in the paper by VAN DER BORCH. The sera giving a positive reaction agglutinated *Proteus OXK* in rising titre 1/80, 1/160 and 1/320, the highest titre in any of the cases was 1/5,120; others gave a reaction for 1/2,500 and 1/640.

D. H.

DELBOVE (P.) & NGUYEN-VAN-HUONG. La réaction de Weil et Félix chez les rats de Saigon-Cholon. [**Weil-Felix Reactions with Rat Sera in Saigon.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. pp. 128–131.

During the years 1934, 1935 and 1936 the sera of 1,300 rats were tested. 117 of these showed a positive reaction in a dilution of 1/100 or higher. *Proteus OX19* was most frequently agglutinated but *OXK* was agglutinated in 14 instances, *OX2* not at all.

D. H.

PARROT (Georges-Victor). Le problème de l'immunité dans les Rickettsioses (immunité ou prémunition?). [Thesis for Doctorate of Medicine.]—63 pp. [Bibliography.] 1937. Algiers.

SPARROW (Hélène). Essai de vaccination de l'homme par voie oculaire avec le virus murin I de Tunis. [**Vaccination of Man against Typhus by the Ocular Route, using Murine Typhus Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1937. Mar. Vol. 26. No. 1. pp. 13–21. With 2 figs.

Emulsion of the infected guineapig brain was made and a drop of this instilled into the eyes of four volunteers; no fever resulted and there was no rise in the Weil-Felix reaction. This was repeated and in two instances slight fever followed in the inoculated persons and a rise in the titre of the Weil-Felix reaction was noted. It was not, however, possible to test these people for immunity.

D. H.

SPARROW (Hélène). Essais d'immunisation contre le typhus avec le virus murin I de Tunis introduit par voie nasale. [**Vaccination against Typhus by Nasal Instillation of the Murine Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1936. Apr. Vol. 25. No. 2. pp. 284–294.

No reaction was noted when the virus, emulsion of brains of infected rats, was instilled into the nostrils of monkeys and guineapigs; when tested later the animals were found to be immune. A few drops of the same emulsion were placed in the nostril of a young man, who developed a very definite but mild attack of typhus, complicated by a severe sore throat; his blood was not infective for guineapigs nor was his blood infective for lice which were fed on him during the fever.

D. H.

SPARROW (Hélène). Essais de vaccination avec les rickettsias du virus murin I de Tunis. [**Vaccination with Virus of Murine Typhus.**]—*Arch. Inst. Pasteur de Tunis*. 1937. Mar. Vol. 26. No. 1. pp. 22-26.

Emulsions of Rickettsia were made from lice intestines; these emulsions were instilled into the eye and nostrils of experimental animals, there was no reaction; but when tested later with a typhus virus the animals were immune. In previous experiments with this virus when passaged in lice, it was noted that there was loss of virulence as compared with the same virus passaged in rats, but on this occasion the virulence increased much above that of the rat passage virus.

D. H.

GIROUD (Paul). Etude des réactions provoquées par les cultures desséchées du virus typhique murin. Immunités qu'elles confèrent vis-à-vis du virus historique. [**Immunity in Animals by Injection of Dried Virus of Murine Typhus.**]—*Arch. Inst. Pasteur de Tunis*. 1936. Nov. Vol. 25. No. 3 & 4. pp. 419-423.

Cultures of rat typhus virus No. 1 were made and dried and the powder rubbed up in yolk of egg, this vaccine was inoculated intradermally in monkeys and guineapigs, this caused a slight local reaction (small nodule) and fever. Two or three doses of the vaccine produced immunity in guineapigs and monkeys.

D. H.

BLANC (Georges) & BALTAZARD (M.). Transmission expérimentale du typhus murin par la puce de l'homme (*Pulex irritans*). [**Experimental Transmission of Murine Typhus by *Pulex irritans*.**]—*C. R. Soc. Biol.* 1937. Vol. 124. No. 11. pp. 1058-1059. [14 refs.]

Fleas (*P. irritans*) were fed on infected rats for a few hours, the infected rats were then removed and normal rats placed in the cage, then fresh normal rats were placed in the cage every two days. The normal rats became infected and the fleas were shown to be infective by injection into guineapigs. In fact, *P. irritans* was shown to be as readily infected as the rat flea.

D. H.

BLANC (Georges) & BALTAZARD (M.). Non-transmission à l'homme du typhus murin par piqûres de puces infectées ("*Xenopsylla cheopis* et *Pulex irritans*"). [**Murine Typhus not transmitted to Man by Bites of Infected Fleas.**]—*Bull. Acad. Méd.* 1937. Apr. 20. 101st Year. 3rd Ser. Vol. 117. No. 15. pp. 434-446. With 13 charts and 4 figs. [24 refs.]

The authors review the literature as regards the infection of rats by fleas, the conclusions they draw are that rat typhus is transmitted primarily among rats through the skin soiled by the faeces of infected fleas or by the crushed bodies of fleas, the virus gains admission either through lesions, scratches, etc., or through the small wounds made by the flea when biting; alternatively, the virus may enter through the mucous membranes or by the digestive route, the fleas being swallowed or faeces licked off the skin and swallowed; or, again, the rat may swallow food contaminated by the faeces of fleas or by the urine of other infected rats, or rats may be infected by eating other infected rats.

In all these ways the flea plays the principal rôle, at first as a multiplier of the virus and secondly as a reservoir. But the authors do not consider that the simple bite of the flea accounts for the infection of the rat or of man provided that contamination of the wounds with infected faeces is excluded. In order to demonstrate this point they carried out a series of experiments, two with *X. cheopis* and two with *Pulex irritans*.

Fleas were fed on infected rats and volunteers allowed these fleas to bite their arms; in two of the experiments the volunteers scratched the bitten area and in two cases in which the arm was placed in a glass jar they could not do so. In all cases the fleas were seen to bite and photographs are given which show the clear evidence of their bites, also in all cases the fleas that had bitten were subsequently shown to be infective.

In none of the four volunteers was there any evidence of infection, although in two instances the skin was contaminated with the faeces of infected fleas and the patient had scratched the area. The authors conclude that the rôle of the flea as a vector of typhus murin from rat to man is practically nil, and it would appear that the ordinary route of contamination of man is above all by the mucous membranes (ocular, digestive, nasal) and that one of the methods of contamination by this route is by the excreta of infected rat fleas. *D. H.*

OKAMOTO (Yutaka). **Experimental Studies on Mice concerning Typhus Fever. I. Demonstration of Rickettsia in Fixed Tissue Sections from Organs of Mice Inoculated with Endemic Typhus Virus.**—*Kitasato Arch. Experim. Med.* 1937. Jan. Vol. 14. No. 1. pp. 23-28. With 6 figs. on 1 plate.

The author recommends the use of sections rather than smears to demonstrate the distribution of Rickettsia in infected animals.

He finds that in mice infected with the virus of endemic typhus by the peritoneal route, Rickettsia could be demonstrated in practically all the organs of the body when sections were prepared and stained by Giemsa method. These sections showed cells crowded with Rickettsia and also the relation of these cells to other types of cell. Rickettsia were most abundant in the serous membrane of the testes and in the capsules of the liver and spleen. They were also found in the endothelial cells of the pleura, pericardium and diaphragm, and also in the serous membranes of stomach, intestine, bladder, pancreas and capsule of the kidney. The Rickettsia cells were also found in parts far away from serous membranes, as, for instance, in the alveola of the lungs and in endothelial cells in the liver and spleen. *D. H.*

PHILIP (Cornelius B.). **Six Years' Intensive Observation on the Seasonal Prevalence of a Tick Population in Western Montana. A Preliminary Summary.**—*Public Health Rep.* 1937. Jan. 1. Vol. 52. No. 1. pp. 16-22. With 1 fig.

A 40-acre tract was selected and ticks were collected by drawing a cloth over the grass and bushes once a week. Ticks began to appear as soon as the snow melted in February or March; the maximum numbers were obtained as a rule in April and the ticks disappeared

in July. The numbers of ticks varied from year to year and from week to week, but this was found to be due principally to the difficulty of collection. D. H.

KOHL (Glen M.). **Hosts of the Immature Stages of the Pacific Coast Ticks *Dermacentor occidentalis* Neum. (Ixodidae).**—*Public Health Rep.* 1937. Apr. 16. Vol. 52. No. 16. pp. 490-496. [Summary appears also in *Bulletin of Hygiene*.]

Dermacentor occidentalis, the common wood tick of the Pacific Coast region, which occurs in Western Oregon and Western California, has been found in the adult state naturally infected with *Bacterium tularense*. Although unsupported by direct evidence apart from that obtained in experimental conditions, epidemiological observations suggest its being also a vector of human Rocky Mountain spotted fever, while, in both its larval and nymphal states, it has been thought to be the chief carrier of bovine anaplasmosis in California. Since *Bact. tularense* has been obtained from adult ticks, it was suggested by PARKER, PHILIP and JELLISON (1933) that the immature stages would be found on small mammals. This suggestion is confirmed in the present paper, which gives the results of investigations carried out in Oregon in 1935, and in California in the following year. It appears that a wide variety of animals serves as hosts of the immature stages of *D. occidentalis*; but, owing to their abundance and general distribution in tick-infested regions, ground squirrels (*Citellus douglasii* and *C. beechyi*) and deer mice (*Peromyscus* spp.) are of major importance in this respect. E. E. Austen.

SOUCHARD & TOURNIER. Un nouveau cas de typhus exanthématique type fièvre fluviiale observé en Indochine. [**Typhus of the Mite Fever Type in Indo-China.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 257-261. With 3 figs.

A severe case of fever with stupor and tremors of hands, and macular rash with primary sore on the left elbow; the Weil-Felix reaction was positive for *Proteus OXK* negative for *OX19*.

Two guineapigs were inoculated with the blood of the patient taken during the fever, these developed slight fever, but there were no other symptoms. This virus was passaged in guineapigs and the virulence was greatly increased, the majority of the inoculated guineapigs died 8 or 9 days after inoculation. Guineapigs which recovered from the fever were not immune to a test typhus virus.

The disease in its clinical aspects and in its effect on guineapigs resembles the mite fever of Sumatra and the scrub typhus of Malaya.

D. H.

DENGUE AND SANDFLY FEVER.

PURCELL (F. M.). **A Dengue-like Fever in the Gold Coast.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 541-544.

In parts of the Gold Coast Colony a form of dengue fever, which affects Europeans, prevails; immigrant Africans may also be infected.

A brief clinical description of some of the cases is given in the present paper. The endemic centres of the disease lie in the forest country in the rainy belts. Cases are not met with in the coast towns or cleared areas. The incubation period is 2 or 3 days and the fever may last from 3 to 10 days. The fever is remittent and a scarlatiniform rash appears on the 4th day as a rule. The patient complains of pain behind the eyeballs, photophobia and pains in muscles and joints.

D. Harvey.

MASSA (Filippo) & DE VIVO (Antonio). Episodio epidemico di dengue a Bender Cassim, nel golfo di Aden. [**Outbreak of Dengue at Bender Cassim, Gulf of Aden.**]*—Giorn. Ital. di Clin. Trop.* 1937. Mar. 31. Vol. 1. N.S. No. 3. pp. 78-79. With 1 fig.

The outbreak started in two sailors being attacked early in May [? 1936] and by the 19th June 64 out of 68 white residents contracted the disease. They were stationed in the marine barracks, the radio station and the administrative quarters. Thirty-six were clinically typical, 29 are said to have been atypical [*i.e.*, a total of 65, whereas the text mentions 64 and the table of details adds to the same figure] with a crisis on 5th, 7th, or even 10th day. The leucopenia was characteristic. The origin of infection was not traced, but it is thought infected persons or mosquitoes, *Culex fatigans*, in caravans from the interior may have introduced it.

H. H. S.

DI GIUSEPPE (Francesco). Considerazioni su alcuni casi di febbre dengue. [**Observations on Cases of Dengue Fever.**]*—Polislinico. Sez. Prat.* 1937. Mar. 29. Vol. 44. No. 13. pp. 610, 613-14, 617-18. [33 refs.]

The author makes some general remarks on dengue fever and records observations on fourteen cases seen by him in Italian Somaliland. They differ in no material point from cases as seen elsewhere, but he stresses the usefulness of the punctate erythema of the palate and the painful enlarged cervical lymph glands (Castellani's signs) in diagnosis.

H. H. S.

COLES (Alfred C.). **An Inquiry into the Aetiology of Dengue Fever.**—*Jl. Trop. Med. & Hyg.* 1937. Mar. 1. Vol. 40. No. 5. pp. 53-55. With 2 figs.

The material on which this paper is based consisted of blood films obtained from 8 patients who had suffered from dengue during the 1928 epidemic in Athens. These films were taken on the 2nd and 3rd day of the fever. These air dried blood films were received by the author in October 1931. In addition films were obtained from two volunteers who had been inoculated with dried serum from cases of dengue. These films were sent by Dr. SCHÜFFNER from Amsterdam and were taken, before symptoms appeared, and daily during the fever; these were received in December 1931. The films were fixed in alcohol and stained with well diluted Giemsa stain for 10 to 12 hours. In all the films taken from the cases of fever during the first 3 days of the disease small intracorpuseular bodies were seen. These were diplococcal or small bacillary forms and measured 0.25 and 0.4 μ in diameter and were stained a bluish red.

These bodies were most numerous in the severe cases and were not seen at all in the films taken before fever commenced or after the 3rd day of the fever. Although the author does not claim that these bodies are actually the virus or germ of the disease he considers that they are certainly associated with it, and suggests the name *Maculae dengui* for these small bodies. Microphotographs demonstrating the bodies in the red cells are reproduced, also diagrams. D. H.

- i. MOSHKOVSKY (S. D.). **Studies on Pappataci-Fever. I. Five Years' Work of the Tropical Institute on the Study of Pappataci-Fever.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 6. pp. 823-826. [In Russian.]
- ii. —, DEMINA (N. A.) & PAVLOVA (E. A.). **II. On the Epidemiology of Pappataci-Fever.**—*Ibid.* pp. 827-831. [In Russian.]
- iii. —, RUSSINKOVSKAIA (E. B.), DEMINA (N. A.) & PAVLOVA (E. A.). **III. The Blood Changes in Pappataci-Fever.**—*Ibid.* pp. 832-837. [In Russian.]
- iv. —, DEMINA (N. A.), NOSSINA (V. D.), EPSTEIN (E. F.), MELIKHAN-SHENINA (M. L.), BASINA (B. S.), PAVLOVA (E. A.) & WUNDER (M. A.). **IV. The Properties of Pappataci-Virus.**—*Ibid.* pp. 838-843. [In Russian.]
- v. —, DEMINA (N. A.), NOSSINA (V. D.), PAVLOVA (E. A.), LIVSCHITZ (I. M.) & WUNDER (M. A.). **V. On the Immunology of Pappataci-Fever and Attempts to produce Artificial Immunization.**—*Ibid.* pp. 844-849. [In Russian.]
- vi. —, NOSSINA (V. D.) & LATISHEV (N. J.). **VI. Data on *Phlebotomus pappatasi*.**—*Ibid.* pp. 850-851. [In Russian.]

In this series of papers are reported the results of five years' investigations on pappataci fever conducted under the direction of Prof. Moshkovsky in the Crimea and in Moscow.

i. The first report deals with the personnel, the general programme of work and future plans.

ii. In the second paper an analysis is given of the incidence of pappataci fever among the immigrant part of the population of Sebastopol. This is distinguished from the incidence among the settled population of the endemic area under the name *loimopotential* (λοιμότης = pestilence), corresponding to Ross' "inoculation rate" in malaria.

iii. The most characteristic change in the blood-picture, recorded for the first time, is the sharp diminution in the number of lymphocytes (average 500 per cmm.) during the first and sometimes second day of the disease.

iv. The properties of pappataci virus were studied in volunteers and in mental cases. Sera taken from patients up to 24 hours after the onset of fever proved to be virulent, the incubation period normally varying from $3\frac{1}{2}$ to 5 days. During the incubation period the virus could be detected 1-2 days before the rise of temperature. Serum taken on the third day of the disease was non-infective.

The effect of various chemical and physical agencies upon the virus was found to be as follows: 19 parts of bile to 1 part virulent serum killed the virus. The addition of 3 parts of bile to 1 part of virus diluted in 10 parts Ringer's solution had a similar action, but was ineffective in the case of 5-fold dilutions or undiluted virulent serum. Equal volumes of glycerine and serum diluted in Ringer's

solution remain virulent 3 days if the dilution is 5-fold, and 1 day if 10-fold, when it loses its virulence after 10 days. A mixture of serum and Ringer's solution 1 : 1 and 4 parts glycerine kept 1 day at 37°C. and 4 days in the ice-chest loses its virulence; 1 part of 2 per cent. solution of phenol added to 1 part of serum diluted with Ringer's solution (1 : 4) kills the virus. When heated to 54°C. during five minutes the serum retains its virulence, but loses it after being heated at 55°C. during 30 minutes. Serum and whole blood dried in a thin layer and kept for three years with access of air became non-virulent.

When kept in an ice-chest the sera remained virulent for periods up to six months.

All attempts to detect the virus morphologically failed, nor was it possible to cultivate the virus. Inoculation of the serum to various laboratory animals (intracerebrally to mice) produced no symptoms in them. Attempts to infect human volunteers with brain emulsion of inoculated mice were negative.

v. The attempts to produce artificial immunization against pappataci fever by using attenuated or killed virus, convalescent sera, alone and with virulent serum, produced inconclusive results. The limited data on acquired immunity show that about 6 per cent. of cases are liable to re-infection in the course of the same season.

vi. The last paper deals with the bionomics of and methods of combating sandflies in Sebastopol. C. A. Hoare.

LE GAC (P.) & ALBRAND (L.). Note sur les modifications du liquide céphalo-rachidien au cours de la fièvre à *pappataci*. [**Changes in the Cerebrospinal Fluid in Pappataci Fever.**]*—Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 354-356.

The interesting point in this report is that the authors found that the amount of albumen in the fluid was much above normal, whereas the cell count was low, not more than 11 per cmm., and these were all lymphocytes. D. H.

HELMINTHIASIS.

KING (E. L.), FAUST (Ernest C.) & SANDERS (John T.). **Intestinal Parasitic Infections complicating Pregnancy.**—*Southern Med. J.* 1937. May. Vol. 30. No. 5. pp. 545-548. [12 refs.]

Routine examinations of faeces were made during 6½ years on 3,290 white obstetric patients, the total examinations on them being over 5,000.

The method of examination is not stated. The percentages of infections found were *E. histolytica* 10, *G. lamblia* 5, *necator* 5·6, *trichuris* 4, *enterobius* 0·7, *ascaris* 3·5, *T. saginata* 0·09, *H. nana* 0·33. "The women were from both rural and urban areas, in the ratio of 55 per cent. rural and 45 per cent. urban. If they had been subdivided into these two groups, the percentages would have been found to be higher in the rural group, because of the unsatisfactory hygienic conditions of their environments." As to *E. histolytica*, it is said: "This figure was obtained from the examination of one to three stools from each patient, which is universally admitted to be inadequate for a proper survey." A similar comment on the equal need of adequate examination for certainty regarding hookworm or trichuris infection is not made, but this is said of the former. "This condition, too, is a common one, and we feel that for several years its importance as a public health problem has been considerably under-estimated." Various writers are cited for supporting the ill effects of this infection on child-bearing, but curiously enough not that of STILES in this very journal of 1912, Vol. 5, p. 163. It is urged that pregnant women found infected should be unwormed if possible, the authors' experience being, that so far from causing abortion or premature labour, the consequent improvement has averted this risk. *Ascaris* should equally be expelled.

In discussion EASTMAN stressed the ill-effects hookworms have on pregnancy and the puerperium and the need to think of hookworm in any anaemia present during pregnancy; *ascaris* may be a serious complication during anaesthesia. GUTTMACHER mentioned cases of foetal infection in women reported by HOWARD and others, and following LOOSS, traced the route of infection from skin to the lymphatics, through the nodes to the lymphatic duct into the circulation and by this to the foetus. [The reviewer has already pointed out that the preference of LOOSS (1911) for the lymphatic route is not necessarily right; it is based on actual findings of larvae in vessels; larvae will readily be found locally in the slow moving lymph current, whereas once they enter a blood capillary they will be carried off in a few seconds. LOOSS' description of their attack and solution by reticulo-endothelial cells in lymph nodes was striking.] Clayton Lane.

CAMERON (Thomas W. M.). **Concepts and Mechanisms of Resistance in Helminthic Infections.**—Reprinted from *Canadian J. Res.* 1937. Apr. Vol. 15. pp. 77-90. [16 refs.]

"The relations that exist between the helminths and their hosts cannot be divided into specific groups. Nevertheless, it is desirable that some classification of these relations, together with clear-cut definition of terms, be widely accepted in order that the subject may be discussed intelligibly. A tentative classification is suggested, which distinguishes between

(i) compatibility and incompatibility, which refer only to the host environment as it exists before invasion by the parasite; (ii) resistance, of various kinds and degrees, which refers to the reaction of the environment to the *presence* of the helminth; and (iii) tolerance and intolerance, which refer to the reaction of the environment to the *effects* of the helminth."

C. L.

DUPRAT. Enquête sur la fréquence des vers intestinaux communs à Sao-Paulo. [**On the Prevalence of the Commoner Intestinal Worms in the Inhabitants of São Paulo.**]—*Rev. Méd. et Hyg. Trop.* 1937. Mar.-Apr. Vol. 29. No. 2. pp. 94-103.

Of 2,267 persons examined by the Kofoid-Barber technique, 91.6 per cent. were found parasitized. Details are given by age, sex, and parasites.

C. L.

- i. SCOTT (J. Allen). **The Incidence and Distribution of the Human Schistosomes in Egypt.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 566-614. With 6 figs. (maps). [23 refs.]
- ii. ——. **Observations on Mortality and Morbidity from Schistosomiasis in Egypt.**—*Jl. Trop. Med. & Hyg.* 1937. June 1. Vol. 40. No. 11. pp. 125-132. With 1 map. [10 refs.]

i. The outcome of this discussion may be summed up in a widening of Allen Scott's final question in (ii)—Do steps taken with the intention of raising the economic standard of any area justify a lowering of the standard of health of those who live in it?

In (i) comprising results of 40,000 of the author's examinations it is found that when correlated with some 2,000,000 made in prominent treatment centres schistosome infection in Egypt falls into four distinct regions: (1) on the northern and eastern edge of the Delta reaching as far as Cairo, 60 per cent. of inhabitants have infection with *S. haematobium* and 60 per cent. with *S. mansoni*; (2) in the apical southern half of the Delta (apart from its eastern edge) 60 per cent. of the people have *S. haematobium* but only 6 per cent. have *S. mansoni* and the line between the first and second areas is sharp and defined but "is not paralleled by any noticeable topographic, hydrographic or demographic variations" and there seems no difference in the number of Planorbis snails in these two regions; (3) in the northern two-thirds of the Nile valley, from about Cairo to Assiut, *S. haematobium* infects 60 per cent. of the population but *S. mansoni* and its transmitting snail are absent; (4) in the southern third of the valley where the old basin irrigation, that is irrigation at flood Nile only, takes the place of the new perennial irrigation, *S. haematobium* alone is present, but infects only 5 per cent. of the population. Heavy infection with *S. haematobium* is, then, associated with perennial irrigation from high level canals, this taking the place of flood irrigation with its alternate flushing and drying of the irrigation canals; and it follows that if a large extension of perennial irrigation is put through, there may be expected in present conditions a twelve-fold increase in the incidence or urinary schistosomiasis.

ii. The mortality from schistosomiasis in Egypt is difficult to estimate both when the infection is the direct cause of death and when it indirectly weights the balance against a host with some other illness; the morbidity is still more difficult to assess owing to different types

and severities of illness, but it will be influenced by the weight of infection in the man himself; a classification of morbidity is proposed with 6 categories of infected persons; and the relative effects of ankylostomiasis and ascariasis on schistosomiasis are touched on, but are being considered elsewhere. In district 4, where 5 per cent. of inhabitants have infection with *S. haematobium*, 1 in 1,000 die from the infection; in districts 3 and 2, 1 in 40 do so; in district 1, the proportion is 1 in 22. On the other hand when the percentage of the population infected rises from 5 to 60 the average number of eggs passed by each person is increased 100 per cent. in the case of *S. haematobium*; and when the percentage infected with *S. mansoni* rises from 6 to 60 the number of eggs is increased 33 per cent. It is not known whether infection with *S. mansoni* is spreading.

"With regard to the future extension of areas of high *S. haematobium* indexes, we have a more sound basis for prediction. It seems all but certain that the conversion of land from the ancient system of basin irrigation to the modern perennial system has caused a marked increase in the prevalence of this species. At the present time the government programme calls for similar conversion of approximately 700,000 acres in the next decade. The conclusion seems almost inescapable that the proposed changes will not only doom an additional million people to infestation with schistosomiasis, but that the average case in these districts will be at least twice as severe as at present and deaths per case will probably double. . . . Does the economic improvement expected in these areas to be converted warrant the impairment of the health of such a large proportion of the population?"

C. L.

GOBERT (E.). Traitement de la bilharziose par l'antimonio-thiomalate de lithium (anthiomaline) à Gafsa. [**Bilharziasis treated with Anthiomaline at Gafsa.**].—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 393-398.

Gobert's experience leaves him with the assurance that anthiomaline is a drug active and manageable in the treatment of infection with *Schistosoma haematobium*.

Half the population of Gafsa has this infection. A 6 per cent. solution of the drug is put up in ampoules; the dose given was 1 cc. when body weight was 20 to 30 kgm., 2 cc. when it was 30 to 45 kgm. and 3 to 4 cc. over that weight. It must be given intramuscularly, usually every other day, from 8 to 10 injections being needed to bring about the passage of dead eggs, and the patient must rest for 2 hours after each injection.

C. L.

FARGES. Essais et résultats de diverses posologies dans le traitement des bilharzioses par l'anthiomaline à la Côte d'Ivoire. [**Results of Different Dosage in the Treatment of Bilharziasis by Anthiomaline on the Ivory Coast.**].—*Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 196-210.

Anthiomaline is considered a marked advance in the treatment of schistosomiasis.

Apparently 91 cases were treated in different ways and from this experience it is concluded that dosage should be high and spaced, namely 1 cc. for every 10 kgm. given at 4 to 7 days' interval, to be

lessened if signs of poisoning come on. But having been powerless to stop a quick endemic extension Farges feels that prevention must have a much wider place in the campaign than it has now. C. L.

MARCHAT (J.) & COUZI (G.). La bilharziose vésicale au 12^e régiment de tirailleurs Sénégalais. Stérilisation par l'anthiomaline. [**Vesical Bilharziasis in the 12th Regiment of Senegalese Sharpshooters cured by Anthiomaline.**].—*Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 211-223.

Forty-one cases were treated at La Rochelle with anthiomaline; the results were excellent.

The observations covered seven months. A total dose of 2.1 grams was quite safe given in 9 injections, namely, 0.12 once, 0.18 twice, 0.24 three times, 0.3 three times [? interval between doses]. Experiments on infecting local snails were negative. C. L.

NAIN (M.). Note sur les indices d'endémicité de deux foyers de bilharziose vésicale marocaine.—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. p. 237.

SILVERIE (M.). Note sur l'existence de quelques foyers de bilharziose vésicale dans la région de Morondava.—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 430-432.

CASTELLANI (Aldo) & JACONO (Igino). Contributo alla conoscenza della bilharziosi vescicale.—*Giorn. Ital. di Clin. Trop.* 1937. June 30. Vol. 1. N.S. No. 6. pp. 163-4, 167-70, 173-5, 177. With 13 figs.

ONSY (Anis). **The Pathogenesis of Endemic (Egyptian) Splenomegaly.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 583-600. With 14 figs. on 4 plates. [71 refs.]

"The importance of the rôle played by the spleen in bilharzial infection was not recognised until very recently. This rôle is connected with the various processes of resistance displayed by the splenic tissues when they become invaded by bilharzia ova. The spleen possesses an enormous number of phagocytic cells, *i.e.*, mobile endothelium, reticular endothelium and sinus endothelium, also the large germinal mononuclear cells in the centre of the Malpighian bodies."

"The pathological findings in 1,400 cases of endemic Egyptian splenomegaly are described. The cause of the disease is infection with ova of one or both of the parasites, *Schistosoma haematobium* and *S. mansoni*. The splenic enlargement is due to response of the reticulo-endothelial tissue of the spleen to deposition of ova in it. As a result there is a cellular response which quickly ends in digestion and removal of the solid remains (parts of the egg-shell) of the ova. With frequent repetition of the process, under the condition of perpetual re-infection in which the patients live, there is produced ultimately a condition of permanent hyperplasia and fibrosis. The splenic enlargement is not dependent on either intestinal or hepatic lesions." C. L.

GIOVANNOLA (Arnaldo). Schistosomiasi intestinale da *S. mansoni* nel Harar e sua trasmissione con il *Planorbis boissyi*. [**Intestinal Infection by *Schistosoma mansoni* in Harar; its Transmission by *Planorbis boissyi*.**].—*Riv. di Parassit.* Rome. 1937. Apr. Vol. 1. No. 2. pp. 157-162. With 1 fig.

The author claims to report the first two cases of intestinal schistosomiasis observed in Harar (Italian East Africa). There was enlargement of liver and spleen, dysenteric symptoms, and ova of *S. mansoni*

in the faeces. *Planorbis boissyi* collected locally was negative for cercariae, 34 of them were placed in dilute faeces from one of the cases for 8 hours and 3 became positive later for *Cercaria mansoni*.

C. L.

SCOTT (J. Allen). **Dilution Egg Counting in Comparison with Other Methods for determining the Incidence of *Schistosoma mansoni*.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 546-565. With 2 figs. [16 refs.]

In the examination of faeces for the detection of infection by *S. mansoni* "no one method will detect all the positive cases . . . There is still need for some new procedure applicable to field conditions which will give a high degree of accuracy in the estimation of incidence at low cost."

There were examined nearly 1,100 faecal specimens by three different techniques and by combinations of them, though only 357 were individually examined by all three. There was egg counting by the Stoll-Hausheer method, using 0.005 cc. of faeces [the figure 0.075 for 1/200 cc. is a manifest printer's mistake] diluted in decinormal caustic soda solution, sedimentation in normal saline, and what is named a concentrated egg count. For egg counting there was used that essential for accuracy, a rectangular field. Sedimentation was carried through in the 357 specimens as described by TOMB and HELMY, 1931 [this *Bulletin*, 1932, Vol. 29, p. 410], while in 234 others it was altered so that while the dilution of the faecal suspension was still 1 in 15, its amount was doubled, and while the fineness of the sieve was the same, namely 100 meshes to the linear inch, its area was more than quadrupled, its diameter being 7 cm. instead of 3 cm. As to the effect of the quadrupled area "no attempt was made to run a long series of distinct checks to compare the two sieves, but in all of the few trials made the larger sieves passed proportionately more eggs." In "concentrated egg counting" the suspension made for the Stoll-Hausheer technique was repeatedly shaken over 24 hours, strained, mixed and poured into a conical urine jar for 30 minutes, tests having showed that by this time 90 per cent. of eggs were in the sediment, even when the lodgement of the rest on the walls of the jar had been disturbed by frequent tapping of its walls over an observation period of 24 hours. At the end of an hour about 99 per cent. of the eggs may be expected in the sediment, but for the classing of a stool as positive or negative, 30 minutes is enough; for of 100 specimens negative after 30 minutes none showed eggs after standing for 24 hours. In normal saline eggs fell at about the same rate. This concentrating, however, disclosed fewer positives than did the usual technique, for though it did in fact disclose a considerable additional number of positives, there were specimens of heavy counts to the ordinary method which were negative after concentration owing to a flocculation which prevented the fall of eggs, while "the same thing occurred in sedimentation in saline." [Since this method disclosed a considerable additional number of positives, the numbers of specimens showing flocculation must have been yet greater, seeing that the total number the technique disclosed was less than those shown by the original Stoll technique.] Comparison of combination of different methods showed these percentages of positives, taking that by one Stoll-Hausheer slide as 100: three slides 152, saline sedimentation 166,

saline sedimentation and one slide 182, sedimentation and three slides 196. It is felt that still higher efficiency will be got by the rectal swab. The claims of individual and community are put in these words :—

"He [the clinician] is properly considering only the welfare of the individual before him. Problems of public health, however, are frequently so overwhelming that welfare of the individual must be merged into welfare of the group. In public health work, where the aim is to produce the greatest total effect, it must not be overlooked that in a routine established to deal with groups of people, an occasional person will be destined to receive, or not to receive treatment, whereas careful study would determine the advisability of the opposite course. Even here the frequent occurrence of error, or even occasional drastic incidents must be avoided."

C. L.

DAY (H. B.). **Pulmonary Bilharziasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Apr. 19. Vol. 30. No. 6. pp. 575-582. With 6 figs. on 2 plates. [10 refs.]

Three males are reported on, in whom there was direct or presumptive evidence of a pulmonary habitat in infection with *Schistosoma mansoni*.

Two men came to the post-mortem table. One had had ascites and, after tapping, the spleen could be felt one finger's breadth below the costal margin, while the liver could not; with "tartar emetic in reduced doses" he seemed on the mend, but died of bacillary dysentery (Flexner type); bilharzial granulomata, with ova of *S. mansoni* in them, studded parts of the peritoneum; many female worms without males were present in the splenic vein, but both sexes in the portal; mesenteric lymph nodes showed the granulomata; the spleen was moderately enlarged with thickened capsule; "the liver was slightly nodular with distinct thickening of the portal tracts from fibrosis," and "revealed the presence of ova in fibrotic infiltrations, while there was considerable pigmentation, chiefly in Küpfer's cells"; the lungs showed many granulomata round schistosome eggs and dilated arteries packed with coupled worms "apparently a pure *S. mansoni* infection," and it is noteworthy that their appearance in the photomicrographs suggest that they have been unharmed by the amount of antimony given; nor does the text tell of any degeneration noted in them; the heart was unaffected. The second man died of congestive heart failure with enlarged right heart and conus (shown by X-rays during life); the liver was of normal size, but nodular and densely fibrosed; many bilharzial worms, male and female, were found in the portal vein; there were ova with "granular infiltration" of the rectal mucosa and a worm in the pancreatic vein. A boy of 10 had some fever, crepitations about the bases of the lungs, but nothing suggestive to X-rays. A sigmoidoscopic examination showed that a *Schistosoma mansoni* infection was present. He was given a diagnosis of an early generalized infection with *S. mansoni*, a prolonged course of tartar emetic, and was discharged in excellent health. Symptoms, diagnosis and treatment are considered in detail. In explanation of the unusual habitat it is suggested tentatively that obstruction of the main portal channels in the liver may open up anastomotic by-passes so that "ova and even worms may reach the lungs without having to pass through normal liver tissue or to travel by the inferior haemorrhoidal plexus." The passages quoted give all that the paper has to say of the actual condition of the liver in these particular cases, though Day adds

"Lampe (1927) has discussed the possibility that cercariae might be able to develop into full grown parasites in the lungs." [See this *Bulletin*, 1927, Vol. 24, p. 986.] C. L.

ROSE (G.) & KOH (T. M.). Beobachtungen an Oncomelanien bei dem Dorfe Ku Dang (Hanghsien, Chekiang) hinsichtlich ihres Verhaltens und hinsichtlich ihrer Infektion mit Cercarien von *Schistosoma japonicum* im Kreislauf eines Jahres (August 1933 bis Juli 1934). [A Year's Observation on the Control of Oncomelania and its Infection with *Cercaria japonicum* in the Village Ku Dang, Hanghsien, Chekiang.]—Reprinted from *Kongressheft d. Tung-Chi Med. Monatsschrift*. 1936. Shanghai. 25 pp. [In German & Japanese.]

The number of Katayama snails examined by sectioning or by escape of cercariae was 20,864. In July none was infected in any site; the percentage was usually highest, up to 21.1, in November, though in one instance it was higher in May, 13.2 as against 10.8; in all, exactly 600 were infected; of them 171 shed cercariae within 24 hours, 317 more showed on section infective cercariae, and 117 showed sporocysts or immature cercariae. The snails were identified by FACHLEUTEN as *Oncomelania hupensis*, *O. möllendorfi*, and *O. nosofora*. C. L.

VAN DEN BERGHE (Louis). A Morphological Study of Bovine Schistosomes.—*Jl. Helminthology*. 1937. Apr. Vol. 15. No. 2. pp. 125-132. With 1 plate & 1 fig. [12 refs.]

The appearance of the review of knowledge on the schistosomes of man [this *Bulletin*, 1936, Vol. 33, p. 1] has prompted van den Bergh to a re-examination of the systematic position of certain schistosomes. He considers that *S. haematobium*, *S. intercalatum*, *S. mattheei*, and *S. bovis* are really biological races of a single species, but he proposes to keep conservatively to two species with subspecies, namely *S. haematobium intercalatum* and *S. bovis mattheei*. C. L.

KENAWY (M. R.). Continuous Venous Hum in Bilharzial Cirrhosis of the Liver.—*Lancet*. 1937. May 29. p. 1281.

"(1) The continuous venous hum previously recorded in Hanot's cirrhosis and Banti's disease also occurs in endemic (Bilharzial) cirrhosis of the Liver in Egypt, with or without splenomegaly. (2) Six cases have been collected in the last two years. In one of them the hum disappeared after splenectomy. (3) Its disappearance was probably due to removal of some venous communication during the operation." C. L.

ROSE (G.). Schistosomiasis in Egypt and its Bearing on the Schistosomiasis Problem in China.—*Chinese Med. Assoc. Spec. Rep. Ser. No. 2*. 86 pp. Shanghai: 41 Tzepang Road. [2s.]

In 1933 Rose spent 5 weeks in Egypt, where he was given orders and permits which insured that he got from all he interviewed the full information, and the facilities to see for himself, which were needful if the experience of antischistosome work in Egypt (where there is promiscuous water and soil pollution, little use of human dejecta as fertilizer and the snails carrying infection are non-operculate) was to

be made available for China (where there was little promiscuous pollution, the dejecta are almost wholly used as fertilizer, and the intermediate snail is amphibious and operculate).

Great stress is laid on the thoroughness of the routine for diagnosis and treatment which obtains in the Egyptian treatment centres, on the sudden antimony deaths, whose reported rarity, 1 in 286,000, it is agreed by all in Egypt does not represent the real state of affairs, KHALIL Bey indeed estimating them as 1 in 2,000 full treatments; the Endemic Disease Section finds that, of some 300,000 who completed treatment, the cure rate was about 75 per cent., and of some 500,000, who did not, about 25 per cent. The need is great for some remedy which combines the cheapness and lightness of carriage of tartar emetic with the painlessness of foudadin when it reaches the tissues, and does not need the prolonged course of injections which both do. Whether a relapse means reinfection or not, and whether these "relapses" respond to treatment in just the same way as do untreated infections is unknown. As to the effects of the Egyptian campaign, "On that point again, complete unanimity exists among all Egyptian specialists. No influence on the mere occurrence of the disease has been obtained by the present methods. But on the contrary, no doubt exists that . . . the grave cases of urinary fistulae, the pyo- and hydro-nephroses, the numerous urinary calculi, all these serious complications of Egyptian schistosomiasis have greatly diminished in number." But if a quarter only of the infected in Egypt could be treated yearly (that is 10 times the present numbers) it is felt that the results would be very different. As to the transference of this knowledge to the conditions present in China, the first need is more knowledge of the biology of the snail *Katayama nosophora*, and of the effects of treatment on *S. japonicum*. Treatment must be an outpatient one, expense forbids anything else, and the reaction of the Chinese to the drugs must be closely watched, for it may be that race will allow of intensification of treatment by antimony. As to the salt used, foudadin is 362.5 times as costly in Shanghai as is tartar emetic; and the test of cure should be failure of miracidia to hatch from stools on three successive occasions. Treatment should be for removal of worms of all sorts and the centres should deal also with the dysenteries. If these control centres became as popular as in Egypt, they would at least prevent the coming into being of "schistosomiasis cripples." In prevention the first need is to look on Japonic schistosomiasis as an occupational disease of the rice farmer who fertilizes his fields with human faeces; it is only the faeces which are infective here and they are already collected and sorted. To sterilize them by heat is generally looked on as expensive and complicated. But mere storage kills the miracidia, and it should be found out how long this has to be kept up on a mass scale to be effective. The individual farmer cannot be depended on to keep faeces till they are not infective, so a village co-operative organization should be brought into being in charge of a central storage depot to which all faeces would have to be brought and which would see that no fertilizer was issued to farmers, as they would be *pro rata*, till it had been stored long enough to be no longer infective. The success of the scheme would depend on the co-operation of villagers and their elders, and on education and propaganda. Destruction of snails is less hopeful as a first mode of attack, for it has never become generally known whether or not the Japanese, with few and small endemic areas, have ever succeeded in clearing

even one of them of infection by any of the advised methods. It is known that *Katayama* infected with *Cercaria japonica* will not mate, and search should be made as to whether some of the other cercariae which infect these snails will not equally lead to the local dying out of the species. As in Egypt the measures should be controlled by a central committee. C. L.

KAWAI (T.). **Experimental Studies on the Clonorchicidal Effect of Gentian Violet. A Supplement: Value of Wakeshima's Egg Counting Method as a Judgment of Anthelmintic Effect of Drugs against *Clonorchis sinensis*.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1937. May. Vol. 36. No. 5 (386). [In Japanese pp. 923-933. [47 refs.] English summary p. 934.]

Gentian violet was given to seven dogs and egg counts of *Clonorchis sinensis*, with which they were infected, were made.

"In light infection (worm estimate = 49) 18 mgs. of the drug per kilo of body weight, administered every three days, were sufficient to reduce worms 61.23 per cent. in 15 days (total dose 1200 mgs.). In a moderately infected case (worm estimate = 333) administration of 18 to 20 mgs. per kilo of body weight per diem for 19 days (total dose 3040 mgs.) reduced the worms by 42.32 per cent. In a heavy infection (worm estimate = 1215) 120 mgs. of the drug (10 to 12 mgs. per kilo) administered per diem reduced the worms 25.10 per cent. in 30 days (total dose 3600 mgs.) and 36.60 per cent. in 45 days (total dose 5400 mgs.): accordingly, it was concluded that:—

"1. The oral administration of gentian violet is effective against clonorchiasis.

"2. The clonorchicidal value of gentian violet is more marked in light cases than in heavy infection.

"3. The clonorchicidal value of gentian violet increases proportionally with the doses administered.

"4. Wakeshima's egg counting method is the best and the most reliable one for the judgment of clonorchicidal effects of drugs." C. L.

GALLIARD (Henri) & PHAN-HUY-QUAT. **Recherches et considérations sur le traitement de la distomatose hépatique à *Clonorchis sinensis*.** [**The Treatment of *Clonorchis sinensis*.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Oct. Vol. 14. No. 8. pp. 1094-1110. [21 refs.]

The literature is surveyed and a report given of, it seems, three cases treated with a course of 15 to 20 intramuscular injections of anthio-maline beginning with 3 centigrams and increasing the amount by 3 centigrams at each injection. In two cases pains and ascites disappeared, in the third the number of eggs lessened. C. L.

ZOTTA (G.), RADACOVICI (E.) & DIMITRIU (O.). **Un cas de distomatose humaine à *Fasciola hepatica*.** [**Human Infection with *F. hepatica*.**]—*C. R. Soc. Biol.* 1937. Vol. 125. No. 14. p. 82.

A well-attested case of infection of man by *F. hepatica* in Rumania. The eggs were typical and were found not only in the faeces but also by the duodenal sound. The patient complained of pain over the gall bladder radiating upwards, nausea, vomiting, and had an eosinophilia of 9 per cent. C. L.

Diss (A.). *Biologie de Fasciola hepatica* L. dans une localisation aberrante. [The Biology of *F. hepatica* in an Abnormal Habitat.]—*C. R. Soc. Biol.* 1937. Vol. 125. No. 15. pp. 157–158.

A subcutaneous infra-mammary tumour removed in Marseilles from a woman of 60 had this fluke within it. The state of the surrounding tissues is described. C. L.

ERRATUM.

Vol. 34, No. 5, p. 398, PENSO's summary on the action of calcium cyanamide on cercariae, the penultimate sentence should read "With *Cercaria burti* [solutions of calcium cyanamide in strengths of] 2 per thousand killed all in 3 minutes and 1 *per thousand* in 5 minutes."

TOMITA (S.). **Clinical Observations on Patients infested with *Hymenolepis nana*, with Special Reference to Changes in their Blood Pictures.**—*Taiwan Igakki Zasshi* (*Jl. Med. Assoc. Formosa*). 1937. May. Vol. 36. No. 5 (386). [In Japanese, pp. 1043–1055. With 1 chart. [16 refs.] English summary p. 1056.]

The report covers 50 patients (44 Aborigines and 6 Japanese or Formosan Chinese) with *H. nana* infection.

In nearly all there was anaemia, mostly due to lessened haemoglobin rather than to fewer red cells, in 18 some leucocytosis, in 38 eosinophilia (with, in 35, a neutropenia), in 23 lymphocytosis. When these changes were marked there was "diarrhoea, constipation, hunger pains, bodily fatigue, slight pyrexia, palidity of face, anorexia, headache, melancholia, palpitations, vertigo, insomnia, convulsions, night talks, nocturnal enuresis, etc." The English abstract has no mention of the presence or absence of other parasites. C. L.

BARNETT (Louis). **Hydatid Disease. Prevalence and Prevention.**—*New Zealand Med. Jl.* 1937. Apr. Vol. 36. No. 192. pp. 105–117. [12 refs.]

The present educational campaign in New Zealand of persuasion, while likely to lessen the incidence of hydatid infection in man, is unlikely to approach eradication. Compulsion is necessary.

After noting the seriousness to man and sheep of hydatid infection in New Zealand [this *Bulletin*, 1937, Vol. 34, p. 21], it is pointed out that the dog population is about 150,000, about a fifth being town dogs not fed on raw offal and almost without infection, while in the country about 40,000 carry this tapeworm. Of the persuasive methods the most important are posters and folders, both highly thought of outside New Zealand; but as to the folders "It has been reported to us that our leaflets are not only left unread, but sometimes are condemned to ignoble use." What farmers most object to is the advice to bring to the boil sheep's offal before feeding them to their dogs. It is urged that the feeding of unsterilized offal to dogs, and the regular giving to them of arecoline every two or three months, should be a matter of law; elsewhere, however, the statement occurs that, though the notification of hydatid disease in man is insisted on by law, the law is constantly ignored by medical men. Since the infection has no noticeable ill-effect on wool or mutton the farmer has no particular incentive to keep his sheep clean of parasites. But

the meat freezing companies kill about 12 million sheep a year and the livers of 4 million are condemned as unfit for food ; this, at 3d. a liver, is a loss of £50,000 a year ; and if these companies would deduct a few pence for each carcass with hydatid the farmer would " sit up and take notice." Moreover, Germany refuses carcasses without livers, which amounts to exclusion of New Zealand mutton, and the British market is nearly saturated. If the Government is ready for compulsion, the committee of the Medical School at Otago has ready a complete scheme. C. L.

PENFOLD (H. Boyd). **The Signs and Symptoms of *Taenia saginata* Infestation.**—*Med. Jl. Australia.* 1937. Apr. 10. 24th Year. Vol. 1. No. 15. pp. 531-535. [10 refs.]

Of 100 consecutive patients, tapeworm segments in the stools were seen by 98, in the underclothing by 93 ; in 2 they were vomited, once after an anaesthetic, once during pneumonia. Pain was present in 47 with very variable characters and in at least 4 it had a typical duodenal ulcer character, with no evidence of ulcer to X-rays and it disappeared for good with expulsion of the worm ; in 2, gall stone colic was simulated and it, too, disappeared when the worm was passed. In one, an experienced practitioner removed the appendix for pain, segments being seen in the stool next day. Acute abdominal tenderness was present in two neurotics. Giddiness was present in 37, appetite and weight were not noticeably altered. Of 20 patients examined for blood change, there was a lymphocytosis of 33 to 59 per cent. in 16, and an eosinophilia of 6 and 13 per cent. in two. C. L.

PALAI (M.). Développement de *Taenia saginata* G., dans les cas de parasitisme multiple. [**Development of *T. saginata* when more than One is present.**—*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 485-490.

Two cases are described, one with 3, and one with 19 worms, the scolex being passed in 14, the neck being present in the others. When numbers are large, there is a lessening of length and of numbers of segments, and the development of the genitalia takes place nearer the head than was held normal by SOMMER in 1874, but this difference is not accompanied by any anomalies of shape.

The segments are classed in 29 grades, that at which eggs first appear in the uteri being xx, and atrophy of the genitalia beginning in grade xxvii. Grade xx was not reached at all in 5 of the 14 complete worms, but in the others it was present variously from segment 444 to segment 562 [mean 489]. C. L.

PENFOLD (H. Boyd). **The Life History of *Cysticercus bovis* in the Tissues of the Ox.**—*Med. Jl. Australia.* 1937. Apr. 17. 24th Year. Vol. 1. No. 16. pp. 579-583. With 17 figs. on 4 plates.

The life span of *Cysticercus bovis* in the ox varies greatly even in the same host ; most are dead in 4, all in 9 months, and the age of any one cannot be estimated from its appearance when it is more than 6 to 8 weeks old. As they degenerate their size lessens and by about two years there is commonly complete disappearance, or at most a small fibrous scar is left. While growth is going on, the cyst at 2 to 4 weeks old has a minute embryo and yellow creamy contents, at

4 to 8 weeks there is growth of the embryo and the contents of the cyst are pasty yellowish green, at 1½ to 9 months there is a complete bladder worm growing in size and strength. All cysts do not go through these stages, for degeneration may begin at 6 weeks. It, too, is described as having three stages; the first is evidently short-lived, for it is seldom seen, the cyst becomes opaque and white and its contents jelly-like; the second is found in from 6 weeks to 5 months and in it the embryo has gone and the cyst contents are bright green from calcareous corpuscles recognizable microscopically; the third stage is seen in cysts 7 or more months old, 1 to 5 mm. across, filled with a dry, dirty-yellow mass, which breaks up grittily between finger and thumb.

C. L.

MOORTHY (V. N.). **A Simple Method of staining and mounting Nematode Larvae.**—*Jl. Parasitology*. 1937. Feb. Vol. 23. No. 1. pp. 100-102.

The method is in essence one for the release, fixing, staining and preservation of guineaworm larvae in cyclops. Release is easiest if the cyclops is dead and the larvae within it still alive, and this condition takes place when the cyclops is brought into a solution of mercuric chloride 0.52, sodium chloride 1.04, distilled water 100; for in it cyclops dies within 2 minutes and guineaworm larvae in over 20 minutes. The note gives full details of the procedure advised.

C. L.

GUNAWARDANA (Samson A.). **Intestinal Worm Survey in 200 Post-Mortem Examinations at the General Hospital, Colombo.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.) 1937. Feb. 10. Vol. 4. Pt. 3. pp. 153-162.

Of these ten pages, full of detail, whose scope the title shows, an adequate abstract seems impossible.

The method was to remove the small and large intestine (not the rectum) and, after taking a sample of faeces from the lower end for a Stoll-Hausheer count, to wash the contents into a vessel, pass this through a sieve with 3,000 meshes to the square inch, open the intestine, and pick out the worms which remained. In this way there were got these numbers—males, females and totals respectively—hookworms 12,124, 14,022, 26,146; ascaris 249, 352, 601; trichuris 1,776, 2,182, 3,958. Enterobius females were found in 61, males in 7, the highest numbers being 643 and 15 respectively. Of the other worms, hookworm average numbers per person increased with age in the first 5 decades from 45.9 to 227, those in the sixth and seventh decades being 93.7 and 207; for ascaris the mean numbers did not vary significantly, though they were highest (5) in the sixth decade. The highest numbers of hookworms were 2,491, of ascaris 54, of trichuris 729. As to the relation of the weight of infection to the disease which caused death, the number of hookworms in two who died of this infection averaged 1,287; other significant average numbers seem to be, for phthisis 203.7, for nephritis 204.8, and chronic circulatory disease 139.2, and at the other end of the scale 16 in chronic gastro-intestinal disease. In only 17 persons were no hookworms seen, the corresponding numbers for ascaris and trichuris were 107 and 37. The average numbers of hookworms in persons from "sanitized" and "un-sanitized" areas were 62.2 and 165.7, those of ascaris being 2.1 and

2.7 and of trichuris 14.7 and 22.2. Only one body had no worms. That there was no relationship between egg counts and hookworm loads Gunawardana's evidence is very clear.

Thus for the seven decades the average hookworm load to the nearest whole number, and the average egg count in hundreds were 46 and 33, 82 and 31, 97 and 38, 139 and 39, 227 and 49, 94 and 31, 207 and 78; while as to particular instances there were 158 females with 78,900 eggs per cc., 1,302 females with 61,600 eggs and 1,457 females with 41,200 eggs per cc.; these with all other egg counts being reduced to the "basis formed faeces." The author points out that his experience in this respect accords with that of MAPLESTONE and MUKERJI (this *Bulletin*, 1936, Vol. 33, p. 117) and it is worth repeating "there is no correlation between ova counts and the number of worms present."

C. L.

KONUS (E. M.) & JAKOUBOVITCH (S. A.). Réactions cutanées d'après Fülleborn comme méthode de diagnostic de l'ascaridose chez les enfants préscolaires. [**The Cutaneous Test of Fülleborn in Diagnosis of Ascaris Infection in Children.**—*Med. Parasit & Parasitic Dis.* 1937. Vol. 6. No. 1. [In Russian pp. 107-114. French summary pp. 114-115.]

The authors tested 70 pre-school children for reaction to ascaris antigen—the dried powder prepared in accordance with Fülleborn's method. In 68.5 per cent. (presumably 48 of the children) the reaction was in accordance with the presence or absence of infestation. In 13 the reaction was positive although no ascaris were recovered by anthelmintic treatment. In 12 a second treatment produced the worm so that in one only did the positive persist without proof of the presence of worms.

H. H. S.

i. WINFIELD (Gerald F.). **Studies on the Control of Fecal-borne Diseases in North China. II. The Distribution of *Ascaris lumbricoides* Infestations in a Rural Population.**—*Chinese Med. J.* 1937. Apr. Vol. 51. No. 4. pp. 502-518. With 2 graphs. [20 refs.]

ii. ——. **Studies on the Control of Fecal-borne Diseases in North China. III. Family Environmental Factors affecting the Spread of *Ascaris lumbricoides* in a Rural Population.**—*Ibid.* May. No. 5. pp. 643-658. With 1 fig.

i. "This is the first of two papers reporting the results of a detailed study of the epidemiology of *Ascaris lumbricoides* in a group of West Shantung Villages. Of the 1,190 persons examined, 81 per cent. were positive for ascaris, 0.2 per cent. harboured trichuris, while no hookworms were found. The entire series had an average corrected (to Porto Rico Standard Population) ascaris egg count of 14,000 eggs per cc. The counts of the children were slightly more than twice as great as those of the adults, while the females had larger counts than the males in each age group from 10-19 on. This series of examinations differs from those made in other parts of the world in that the percentage of heavy cases is smaller than usual while the number of medium and light cases is greater. This points to the fact that the life habits of the people of these villages are favourable for the spread of ascaris, while the general climatic conditions tend to hold the infection in check. The effect of a dry climate in reducing parasitism in this area is indicated by comparisons with the results of a similar study carried out by Cort and Stoll in East Shantung, where a slightly larger and more evenly distributed rainfall coupled with lower

temperatures, permits the more frequent occurrence of ascaris, trichuris and hookworms."

ii. "This paper reports the results of environmental studies in 83 families that are typical of west Shantung rural conditions. Thirty-five of these families were lightly infested with ascaris, while 48 were heavily infested. Isolations from soil samples demonstrated that ascaris eggs were widely distributed within the courtyards, rooms and streets of the villages. The number of eggs isolated from the heavy families was about twice that from the light ones. This difference in the number of eggs in the soil of the household [*sic*, ? houseyard] seems to be the chief explanation of the difference in worm burden since the water supply and source of fresh vegetables for these two groups of families were identical. The defecation habits of the pre-school children is [*sic*] the chief factor in building up and maintaining the heavy soil infestation within the household. The pen-latrine is an additional source of infection, with eggs being tracked from it into the household by people and animals and carried by chickens. Methods of emptying the pen-latrines and handling fertilizers also contribute to the pollution of the household and village. The scavenger dogs aid in the dissemination of viable ascaris eggs within the village. The food and personal habits of the villagers amply explain how the eggs may be ingested. The lightly infested families have fewer children and are economically better off than are the heavy families. The conditions revealed by this study not only permit the transmission of ascaris, but also contribute to the spread of other fecal-borne diseases."

[A pen-latrine is a place where the family faeces serve as food and as a wallow for the family pig, which then tracks about the family yard.] C. L.

ZATOURENSKAYA (B.) & VICHNEVSKAYA (S.). Sur l'action de certains facteurs chimiques et physiques sur les oeufs d'*Ascaris lumbricoides*.

[The Action of Certain Chemical and Physical Factors on Ova of *Ascaris lumbricoides*.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1936. Vol. 5. No. 5. [In Russian, pp. 675–678. With 1 fig. French summary p. 679.]

Chloride of lime up to 30 per cent. acting on ova of *A. lumbricoides* kept in a moist chamber at 25°C. prevents evolution to the larval stage in only 50 per cent. ; at 50 per cent. strength of lime they are killed. Concentrated HCl kills them or causes arrest of development in the 2–4 blastomere stage. Clearly, chloride of lime cannot be relied upon to destroy helminth ova in faeces exposed to the air. Drying on a thin layer is fatal to ova in the first stage, when embryonated they die more rapidly under drying than with subjection to 50 per cent. chloride of lime. H. H. S.

LAPAGE (Geoffrey). The Effects of Some Natural Factors on the Second Ecdysis of Nematode Infective Larvae.—Reprinted from *Univ. Cambridge Inst. Animal Path. Fourth Rep. 1934–35*. 25 pp. [30 refs.] 1937. Imperial Bureau of Agricultural Parasitology. Winches Farm Drive, Hatfield Road, St. Albans. [4s.]

These experiments were carried out on nematode larvae which do not enter the definitive host by the skin.

In these circumstances the second ecdysis is not caused merely by change of temperature or by the pH of the environment, but these changes may so alter the sheaths that osmosis may bring about an ecdysis in which inorganic salts play a notable part, and this part may be varied by normal or abnormal changes in the contents of different parts of the alimentary canal and may perhaps determine immunity,

host restriction and host resistance. The sheaths on larvae long on pastures may get brittle and easily broken but this is not true ecdysis. Indeed in nature mechanical damage or friction does not cause true ecdysis. The boring movements of larvae which do not penetrate the skin are perhaps relics dating from the time their ancestors did so. The larvae concerned were those of *Haemonchus contortus*, *Ostertagia circumcincta* and *Trichostrongylus species*. C. L.

DIEHL (Friedrich) & SCHWOERER (Paul). Allergie der menschlichen Haut gegen *Ascaris lumbricoides*. [**Intracutaneous Reaction of Man to Ascaris Antigen.**—*Arch. f. Experim. Path. u. Pharm.* 1936. Oct. 20. Vol. 183. No. 1. pp. 1-8. [10 refs.]

The object of the investigation was a three-fold test of sensibility to ascaris antigen: a general test of sensibility as measured by the greatest dilution in which it gave a reaction; one of the sensibility of infected, as compared with non-infected; one to determine whether those with allergic symptoms (two had urticaria, the others asthma), were more sensitive to this antigen than were those who had not.

Many ascaris were used to make the antigen, which consisted mainly of the body fluid of worms placed in Ringer's solution and filtered, the fluid then heated and filtered twice to get rid of protein; it was then a nut brown, sterile fluid with the ascaris smell even when much diluted; about 0.05 cc. was used to impregnate the skin of the back, and the result was held positive if the wheal attained a considerable size [sich deutlich vergrosserte] and showed a red halo. The first injection was generally with one part in a hundred million, the following ones with a tenfold increase of strength till a positive reaction was obtained.

The percentages of positive reactions were as seen in the Table:—

Dilution of antigen	Not allergic	Those with allergic illness	Not infected with ascaris	Ascaris infected
1 in 100,000,000 ...	1.6	4.4	1.9	0
„ 10,000,000 ...	3.6	14.3	6.9	4.1
„ 1,000,000 ...	18.0	28.6	20.9	15.8
„ 100,000 ...	28.5	47.5	34.6	21.2
„ 10,000 ...	48.4	61.3	49.4	41.9
„ 1,000 ...	78.4	78.6	76.4	80.6
„ 100 ...	90.5	96.2	91.4	95.6
„ 10 ...	99.2	100.0	98.7	100.0
„ 1 ...	100.0	100.0	100.0	100.0

C. L.

BACHMAN (George W.), RODRÍGUEZ MOLINA (Rafael), HOFFMAN (W. A.) & GONZÁLEZ (José Oliver). **A Study of Parasite Control in Puerto Rico over a Period of Five and a Half Years.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1937. June. Vol. 12. No. 4. pp. 369-388. With 10 charts. [20 refs.] [Spanish version pp. 389-404.]

Examinations of 188 persons were carried out eight times during 5½ years, using on each occasion 0.02 gm. of faeces, diluted in decimal caustic soda solution.

Two anthelmintic treatments were given during the first two years consisting of a mixture of carbon tetrachloride and oil of chenopodium in the proportion of 11 to 4, the dose being 0.6 cc. at 3 years with an increase of 0.2 cc. for each year of age so that it reached 3 cc. at 15 years, which dose was not increased for any age. All were treated in hospital. There were also educational and sanitary campaigns, with talks on body and home hygiene, cinemas, and demonstrations; and house-to-house visits by social workers during part of the time. These plantation workers lived in more or less substantial frame houses, each with a latrine, the houses scattered and separated, with heavy vegetation round them.

Anaemia, present in the author's view when the haemoglobin was below 70 per cent. to the Sahli haemoglobinometer (which takes 14.5 gm. as 100), was found in 68 per cent. of those examined, particularly among children. Malaria is endemic here. Of 40 soil samples from the yards of houses, only 4 were positive for hookworm larvae; of 20 taken near houses, 11 were thus positive, while from nearby sugar cane fields the percentage of infected specimens was high. Hookworm infection fell after two treatments from a percentage, to this technique, of 70, to one of 0.6, remained below 20 while there was supervision, rising rapidly as soon as it ceased, being 68 at the end; the mean egg counts at the beginning were 6,787 and at the end 5,029 to the gram. *Ascaris* incidence fell from 61 to 7 per cent., rose rapidly to 67 even though the vigilance of the campaign continued, dropped to 46 and ended at 50; and, this in spite of all houses having latrines and of the stress laid on this point by "prevailing opinion," as the essential step in the prevention of this infection. *Trichuris* infection worsened during the period; it started with a percentage of 80, fell to 55, and in the last 19 months remained about 90. C. L.

LEAGUE OF NATIONS. HEALTH ORGANISATION. INTER-GOVERNMENTAL CONFERENCE OF FAR-EASTERN COUNTRIES ON RURAL HYGIENE. PREPARATORY PAPERS RELATING TO BRITISH INDIA. Ser. L.O.N.P. 1937. III. 6. pp. 92-98.—**Hookworm Infection in India.**

Some 210,000,000 persons in India have, it is estimated, this infection, but it is held that the average intensity of infection is low compared with Porto Rico, Central America and China. Though soil pollution is unusual, faeces are rarely used as a fertilizer. The heavy infections among estate coolies are probably due to aggregation of population when, for purposes of cultivation, the rainfall is high. Necator infection predominant in south and east India [it is the only infection about Darjeeling in the Himalayan foothills] is more and more displaced by *ancylostoma* as one passes west and north. The incidence of hookworm is given for various parts of India, but whether the diagnostic techniques used were of equal accuracy in all instances, is not noted. Hookworm infection as a public health problem is faced squarely. There is none of the suggestion, too often apparent, that all that can be done at the moment is all for which good hygiene calls.

"Whatever views may be held as to the effect of small numbers of hookworms on the health of the persons concerned, questions of emphasis and expense would undoubtedly remove the hookworm problem from immediate public health consideration over the greater part of India As has been amply demonstrated in many places, the provision of latrines is a corner-stone in the control of hookworm infection without which

little progress can be made, and it is becoming more evident that public latrines are as a rule not adequate for this purpose. On the scores of expense, utility, safety and general adaptability, the bore-hole latrine would seem to be the best type to adopt, in areas where the soil is suitable, as a household latrine."

[It is clearly felt that the dropping of faeces directly into the subsoil water is a smaller risk to public health than is constituted by hookworm infection—a tribute to the harm done by the latter. It will be remembered that in Tonga these latrines are "an excellent breeding ground for cockroaches" (this *Bulletin*, 1937, Vol. 34, p. 432).]

C. L.

CUMMING (Hugh S.). Sur l'ankylostomiase aux Etats-Unis. [**Ankylostomiasis in the U.S.**].—*Bull. Office Internat. d'Hyg. Publique*. 1937. Apr. Vol. 29. No. 4. pp. 748-751. [10 refs.]

A record of the literature leads to the conclusion that in the United States hookworm infection in mines is not a grave problem while on the surface, it is so in the Southern States.

C. L.

SMITH (W. H. Y.), McALPINE (James G.) & GILL (D. G.). **Intestinal Parasite Survey in Alabama. I. A Comparative Study of Two Hookworm Anthelmintics.**—*Amer. Jl. Public. Health*. 1937. May. Vol. 27. No. 5. pp. 471-475. With 1 map and 1 chart. [10 refs.]

For examination of faeces "the Caldwell technique was used rather than the Stoll." Of 14,622 specimens, 32.3 per cent. were positive when 0.01 gram was so examined, the Rockefeller Commission of 1914 [which often used much more faeces, at least in other countries] had found 53.6 per cent. positive. Treatment was by: (1) Carbon tetrachloride 2, *Ol. chenopodii* 1, given in a dose of 3 minims per year of age with a maximum of \mathbb{M} 30; (2) tetrachlorethylene 0.2 cc. per year of age (maximum 3 cc.), odd numbers being given one treatment and even numbers the other. When some 800 in each category were re-examined 10 to 14 days later those found positive were 9.4 and 26.3 per cent. respectively. The infection was markedly lower in coloured than in white persons.

C. L.

ESPIÉ (A.). L'ankylostomiase en Tunisie dans les terrains cultivés et les campagnes. [**Ankylostomiasis in Cultivated Land and Open Country in Tunisia.**].—*Bull. Office Internat. d'Hyg. Publique*. 1937. Apr. Vol. 29. No. 4. pp. 778-783.

"*Ankylostomum duodenale*," identified by its eggs, is present in marshy insanitary spots in South Tunisia.

In 300 faeces from inhabitants of Gabè these eggs were found by an unstated method in 82 (27.33 per cent.). With these eggs there were others: *Ascaris* 5 times, *trichuris* 8, *ascaris* and *trichuris* 64, *H. nana* and *trichuris* 1, *ascaris*, *trichuris* and "a strongylus" 4. In Gafsa, in 200 faecal examinations there were "*Ankylostomum duodenale*" alone 1, with *ascaris* 4, with *trichuris* 6, with *ascaris* and *trichuris* 35, with *trichuris* and "a strongylus" 1, with *ascaris*, *trichuris* and "a strongylus" 2, with the first two and *strongyloides* 1, and with these two and *H. nana* 1.

C. L.

VILLEJEAN (A.). L'ankylostomiase dans les mines en France. [**Ankylostomiasis in French Mines.**]—*Bull. Office Internat. d'Hyg. Publique*. 1937. Apr. Vol. 29. No. 4. pp. 752-777.

A survey of the literature concludes with the statement that ankylostomiasis has practically disappeared from most mines; some are slightly infected, but anaemia has practically gone. Still, there should be maintained examination of miners on enlistment and thereafter periodically, with treatment of those notably infected.

C. L.

FIKRI (M. Mahfouz) & GHALIOUNGUI (Paul). **Ancylostoma Anaemia.**—*Lancet*. 1937. Apr. 3. pp. 800-802. With 2 charts. [12 refs.]

The blood volume was estimated by an injection, during one minute exactly, of a solution of Congo red, as advised by TODD and SANDFORD, and the drawing off of blood $2\frac{1}{2}$ minutes after the end of the injection; the haematocrit reading and the colour of the blood plasma were then noted. It is concluded that so far from there being an increase in blood volume, there is a lessening due to the decreased volume of red cells. [The conclusion depends on the inference that the reticulo-endothelial system does not remove injected dyes from the blood within $2\frac{1}{2}$ minutes.]

"The glucose tolerance of 18 cases of pure ancylostoma infestation has been investigated. In 12 there was some abnormality in the extent of the hyperglycaemic response, its duration or its fall. In 9 of these two or more defects were associated.

"The blood-sugar curves after intravenous injection of glucose were determined in 8 cases. They were normal and did not correspond to the respective oral responses.

"Interference with absorption caused in some way by the presence of the ancylostoma worms and by their bites in the duodenum is surmised as an explanation."

C. L.

VILLELA (Gilberto G.) & TEIXEIRA (J. Castro). **Blood Chemistry in Hookworm Anemia.**—*Jl. Lab. & Clin. Med.* 1937. Mar. Vol. 22. No. 6. pp. 567-572. With 1 chart. [23 refs.]

In hookworm anaemia with oedema, low values for plasma proteins are frequently found.

The normal values for plasma proteins are put by various workers as being from 7 to 8.8 g. per 100 cc. Apparently the authors' normal average worked out at 7.82, with albumin 5.1 and globulin 2.4. In five persons with hookworm anaemia and with haemoglobin between 32 and 66 (mean 55) there was no oedema, the mean protein was 7.2 and the mean albumin 4.5; in 9 such with haemoglobin between 20 and 70 (mean 35.7) there was oedema, the mean protein was 6.34 and the mean albumin 3.7. The conditions bringing on oedema are the constant drain of proteins by loss of blood coupled with under-nutrition, that is, with the intake of insufficient protein to make good the loss.

C. L.

EGYPT, MINISTRY OF PUBLIC HEALTH: THE RESEARCH INSTITUTE AND THE ENDEMIC DISEASES HOSPITAL. FOURTH ANNUAL REPORT 1934 [KHALIL (M.)].—The Toxicity of Carbon Tetrachloride CCl_4 . pp. 4-7.

Notes on a death 6 days after taking a mixture of 0.5 cc. of carbon tetrachloride with 0.5 cc. of oil of chenopodium given for ascaris infection, to a male child of 7 years, weighing 22 kilos.

At autopsy two ascarids were coming out through the nose, there were about 40 in the stomach, and clumps of them 10 inches above the ileo-caecal valve with "definite partial obstruction," congestion and petechial hemorrhages. "The duodenum was found normal, no ancylostoma worms were found," though of their absence from their more usual sites there is no mention. "No other abnormality could be seen in the intestines. The liver was slightly enlarged and fatty. The spleen was normal in size. The kidney capsule [was] easily taken off, and [there were] no signs of nephritis. Histological studies of this case will be reported in the clinical and pathological section" [? of some other publication]. C. L.

SCHWARTZ (Benjamin) & PORTER (Dale A.). Tests with Hydrogen Peroxide as an Anthelmintic.—*Rev. Med. Trop. y Parasit.* Habana. 1937. Jan.-Feb. Vol. 3. No. 1. pp. 11-24.

The tests were carried out on white rats and on dogs.

The experiments were undertaken *in vivo* from the conviction that "no reliable conclusions regarding anthelmintic efficacy can be drawn from tests *in vitro*." In rats the infection was one with *Nippostrongylus muris* 6 to 8 days old, the drug was given through a catheter passed down the throat as far as possible under light anaesthesia and the rats faeces were examined during their life and the intestines after they had been killed. The rats weighed about 150 grams and were given 3 to 4 cc. of a 0.5 to 1.5 per cent. solution of hydrogen peroxide. After a 0.5 per cent. solution the percentages of worms passed compared with the total recovery were 1.8 to 2.1; after a 1 per cent. solution, 45.5 from 3 cc. and 60.8 and 63.3 from 4 cc.; after a 1.5 per cent. solution, 51.5 to 93.3 from 4 cc. Three pups, 32 days old, weighing about 2 kilos, were given two treatments of 2 oz. [say 60 cc.] each of a 1.5 per cent. solution, and passed, of the *Toxocara canis* they harboured, 85.7, 90 and 100 per cent., and of *Ancylostoma caninum* 0, 37.5 and 50 per cent.; their three litter mates, at 46 days old, were given one such treatment and passed, of *T. canis* 64.8, 94.1, and 100 per cent., and of *A. caninum* 33.3, 42.9 and 100 per cent. To three full grown dogs of 6.2 to 8.4 kilos were given 2 oz. of the 1.5 per cent. solution once; the percentage efficacy for *A. caninum* was 0, for *T. canis* 100, for *Toxascaris leonina* 16.7 and 83.3, for *Dipylidium caninum* 0 and 0.

[Seeing that a 3 per cent. solution of H_2O_2 evolves ten times its volume of O_2 , it will be realized that if the weaker solutions used here were given to man weight for weight, the figures got from the rats would mean for him a dose of from 400 to 1,600 cc. of water, with a prompt escape of 666 to 8,000 cc. of oxygen into stomach or duodenum, or both; from the younger puppies the comparative figures for man would be 1,800 cc. of fluid and 9,000 cc. of evolved oxygen, a total of nearly 11 litres of suddenly added contents.] C. L.

ARREZA-GUZMAN (A.). Recherches expérimentales sur le traitement de la strongyloïdose murine. [Experimental Work on the Treatment of Strongyloides in Rats.]—*Ann. Parasit. Humaine et Comparée*. 1937. Mar. 1. Vol. 15. No. 2. pp. 125-145. [30 refs.]

Rats infected with "*Strongyloides ratti*" were treated with pyrethrines, gentian violet, thymol, oil of chenopodium, tetrachlorethylene, and glycerine, and the worms were not killed off though the rats were.

Even when these drugs killed the host, the intestine still contained large numbers of living strongyloides; the cure is still to seek. Again when there were added to 5 cc. of Ringer's solution washed strongyloides and two drops of a 1 in 1,000 alcoholic solution of thymol or two drops of oil of chenopodium the lethal action was definite, with tetrachlorethylene this was doubtful and with methyl violet and the pyrethrines there was none. Here, it is claimed, is a simple and exact method for testing the efficacy of new drugs. [This important claim, it is here suggested, is not good. As these very experiments show, results from *in vitro* tests cannot be transferred to conditions *in vivo*; thus thymol after absorption into man's body is excreted as a glucuronate; it has been changed in the body and the analogy with some other drugs suggests that it is some substance which comes into being during such change which is the true anthelmintic. Nor can *in vivo* experiment in one animal be taken unhesitatingly as evidence for what happens in another, since such an anthelmintic substance as may be formed by physiologico-chemical changes in one animal will not necessarily be formed in another; for if the physiological chemistry of all animals were alike there would not be that marked restriction of particular parasites to particular hosts which there is. The results of anthelmintic experiments, whether of those *in vitro* or of those *in vivo* on animals other than man, may be taken only with hesitation as being certainly true for man.] C. L.

HINMAN (E. Harold). A Study of Eighty-Five Cases of *Strongyloides stercoralis* Infection, with Special Reference to Abdominal Pain.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 531-538.

"An analysis of 85 cases of *Strongyloides stercoralis* infection is presented. Diagnosis was proved in each case by stool examination. Among etiological factors studied it was found that there was a marked predominance in the male sex, in the white race, and in the second, third and fourth decades of life. Seasonal distribution and occupation appear to be of some significance. The most frequent presenting complaint was abdominal pain. Diarrhoea was less common. The history revealed that in addition to abdominal distress and diarrhoea, nausea and vomiting, headache, anorexia, loss of weight, weakness, malaise, constipation, distension and flatulence were frequent symptoms. Physical examination revealed localised abdominal tenderness in 34.1 per cent. of the cases. Fever above 101°F. was infrequent. Laboratory studies showed three of the thirteen cases with hypochlorhydria, a moderate secondary anemia, rarely leucocytosis, and an average of 8.6 per cent. eosinophils in forty-seven cases. The diagnosis of *Strongyloides* infection must be considered in all cases presenting abdominal distress, vague dyspepsia, diarrhoea or eosinophilia. Stool examination in most cases will readily exclude this condition." C. L.

BRUNS (Hayo). Ueber *Anguillula (Strongyloides) intestinalis*.—*Ztschr. f. Hyg. u. Infektionskr.* 1937. Feb. 18. Vol. 119. No. 3. pp. 336-351. [21 refs.]

ROSS (I. Clunies). **Infestation of Man with *Trichostrongylus colubrifomis* from Sheep.**—*Med. Jl. Australia.* 1937. Jan. 23. 24th Year. Vol. 1. No. 4. pp. 122-123.

The actual experiment is concerned with the transference of this infection from man to sheep.

"Two laboratory attendants at the McMaster Animal Health Laboratory, who were associated with experimental work on the small *Trichostrongylus* of sheep which necessitated the frequent handling of infective *Trichostrongylus* spp. larvae, were both found to be passing strongylid eggs in their faeces. On culture, *Trichostrongylus* spp. larvae were recovered."

Two lambs were taken on the day of their birth, reared in cages, fed on cow's milk and examined by D.C.F. 3 times a week for 3 weeks with no finding of eggs. To one there were then given 210 infective *trichostrongylus* larvae from eggs derived from the faeces of one of the attendants. The amount of faeces examined at a time was 8 grams and in this quantity the number of *trichostrongylus* eggs found was 2 on day 18, 8 on day 19, 250 three days later and 400 a week later. It was killed on day 26, minutely examined and 5 male and 12 female *T. colubrifomis* found in the small intestine. The faeces of the control lamb, examined in the same way, were free from eggs a fortnight later. "There appears to be little doubt in this case that the infestation in man was brought about with *Trichostrongylus colubrifomis* of ovine origin."

C. L.

HALL (Maurice C.). **Studies on Oxyuriasis. I. Types of Anal Swabs and Scrapers, with a Description of an Improved Type of Swab.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 445-453. With 1 fig.

The swab which has best come through Hall's tests for the detection of threadworm infection is a glass rod round whose point is wrapped a square of "Cellophane" and whose butt perforates a rubber cork, which in turn is fitted into the mouth of a test tube for clean and safe carriage.

The ideal swab "should pick up pinworm [*enterobius*] eggs, when these are present, quite dependably; should deliver them to a microscope slide dependably, with the minimum amount of manipulation that involves dilution or possible loss of eggs from any cause; should be easy to transport with no loss of eggs and with safety to persons handling the swab; and should cause the patient little or no inconvenience in its use. For research it is desirable to be able to control the moisture factor and so maintain the viability of the eggs." Absorbent cotton swabs did not release all eggs on the slide, chamois leather was not suitable for the swabbing movement needed. Rayon fabric let eggs through. Celluloid scrapers 4.5 cm. long by 1 cm. were effective, but might lose eggs in transport. The "Cellophane" swab

was made by folding a 3 cm. square of "Cellophane" in two equal rectangles, placing

" a glass rod about 8 to 10 cm. long by 4 mm. wide, with rounded ends, between the halves of the folded square and at right angles to the fold about one-third of the distance from one end of the fold, folding down the short end diagonally and wrapping it about the rod, then folding down the long end diagonally and wrapping it about the short end and the rod, and fastening the folded cellophane to the rod with a small rubber band. The rod was first pushed through a perforated rubber cork of a size suitable for corking a test tube. This combination of cellophane, glass rod, rubber cork and test tube constituted a simple set-up which met several requirements for a satisfactory swab for large-scale operations. The swab was used dry and pinworm eggs adhered to it or were scraped into the folds over the tip, so it acts both as a swab and a scraper. To make the examination for eggs, the cellophane was pushed forward over the tip of the glass rod for a short distance, and the cellophane tip which had been used for swabbing was cut off beyond the rod tip with a pair of fine scissors, the tip being held at the time in a mixture of decinormal sodium hydroxide and stain; the cellophane tip was then flattened out with the rod and a pair of forceps, a couple of drops of additional sodium hydroxide put on the cellophane, and the preparation covered with a cover glass. The eggs adhering to the cellophane or released under it were readily found by microscopic examination through the thin transparent cellophane, and no separation of the eggs from the contact part of the swab by any form of manipulation is needed with this type of swab, contrary to what is true for other types."

The stain came into use because the blue dye in the rayon used was not fast and stained the enterobius eggs and embryo conspicuously and selectively. Attempts to identify the dye have hitherto been unsuccessful. The appearance of these eggs outside the anus is irregular in infected persons; in groups examined four times the percentage of positives displayed by the first and by the total of four examinations were 12.5 and 87.5, 15 and 64.4, 10 and 52. The number of eggs on a swab has no correlation with the number of threadworms present. The swab is designated the NIH swab. C. L.

BATTAGLIA (Alberto) & DI FIORE (Honesto). Appendicitis a oxiurus. [*Enterobius Infestation and Appendicitis.*]—*Prensa Med. Argentina*. 1937. July 7. Vol. 24. No. 27. pp. 1349–1359. [48 refs.]

The authors, having recently observed three children with appendicitis associated with the presence of *Enterobius*, thought it would be interesting to review the operations for appendicectomy performed at their clinic during the past two and a half years. They preface their remarks by references to the literature on the subject. They have investigated 542 clinical histories and found that in 11, or 2 per cent., *Enterobius* was found in the extirpated appendix. Of the total, 5 were among 405 patients under 15 years of age (1.2 per cent), and 6 among the remaining 137 over 15 years (4.3 per cent.). Nine of the eleven suffered from symptoms of chronic appendicitis, one of them with acute exacerbations from time to time, the other two suffered from acute appendicitis (children of 11 and 12 years of age). Their own three cases were somewhat unusual; eosinophilia was not marked, 4, 5 and 8 per cent. respectively, ova were not found in the faeces nor in the lumen of the appendix, although the worms were many, 29, 62 and 83 respectively, and the majority were females. H. H. S.

- i. HALL (Maurice C.) & COLLINS (Benjamin J.). **Studies on Trichinosis. I. The Incidence of Trichinosis as indicated by Post-Mortem Examination of 300 Diaphragms.**—*Public Health Rep.* 1937. Apr. 16. Vol. 52. No. 16. pp. 468-490. [18 refs.]
- ii. ——— & ———. **Studies on Trichinosis. II. Some Correlations and Implications in Connection with the Incidence of Trichinae found in 300 Diaphragms.**—*Ibid.* Apr. 23. No. 17. pp. 512-527. [11 refs.]
- iii. ———. **Studies on Trichinosis. III. The Complex Clinical Picture of Trichinosis, and the Diagnosis of the Disease.**—*Ibid.* Apr. 30. No. 18. pp. 539-551. [14 refs.]

i. The method of diagnosis was two-fold: a squash preparation of 1 gram of diaphragm; a digestion for 24 hours in artificial gastric juice of a mean of 113 grams, the fluid being run on to a screen of 80 to 100 meshes in a Baermann funnel and allowed to stand for an hour. Of the 300 diaphragms 41 were positive, of these the latter brought to light 70.7 per cent. and missed 29.3 per cent., but it missed no case in which the larvae were living. When they are not, its failure is probably roughly measured by its detection of 23 larvae in a 100-gram sample when the microscope has counted 993 in 1 gram. This is the writers' summary:—

"A study of 300 diaphragms from cadavers, coming from 10 hospitals in Washington, D.C., and 1 hospital at Baltimore, Md., shows 41 diaphragms infested with trichinae, an incidence of 13.67 per cent.

"The samples include cases from 5 Federal hospitals to which patients are sent from all over the United States, and from 6 Washington hospitals with cases originating widely over the United States, and they run the range of childhood to old age, military and civil life, association with land and sea, sane individuals and mentally deranged hospitalized cases, black and white, male and female, and high and low economic-social status.

"All diaphragms were examined both by the direct microscopic method and by the digestion-Baermann method, since both methods have special value for certain types of infestation and both have certain limitations, the two methods being supplementary in these respects.

"Examinations were made on a quantitative basis of trichinae per gram of diaphragm muscle examined. On this basis the series is arbitrarily divided into seven groups of lighter to heavier infestations, as a basis for tentative assumption and for further consideration.

"Live trichinae predominate in light infestations and dead trichinae predominate in heavy infestations, and the theory is tentatively suggested that the rapidity of calcification may be proportional to intensity of infestation.

"On the basis of 1,778 cases reported up to the present time, the writers conclude that an indicated incidence of approximately 12.5 per cent., an unweighted average, is a conservative figure, probably definitely too low. If this figure is indicative of incidence throughout this country, there are probably several million persons in the United States who are infested with trichinae, among whom are possibly several hundred thousands who have had clinical trichinosis never diagnosed as such, and there are possibly several thousand deaths annually from this cause.

"The following point is emphasized: That the United States apparently has the greatest problem of trichinosis of any country in the world, a problem involving, in one way or another and in some degree, several million persons. The incidence in man is greater than the incidence in garbage-fed hogs.

" The background of the problem is considered, and an outline of the measures necessary for the control of the parasite, *Trichinella spiralis*, is given.

ii. " On the basis of a study of 300 diaphragms reported in a previous paper by the present authors, which shows an incidence of 13.67 per cent. of trichina infestation, the writers have undertaken a study of correlation of incidence with population groups with the following results :

" The incidence by groups, in descending order of incidence, is as follows : Navy, 33.3 per cent. ; groups associated with extensive travel by sea (Navy and merchant marine), 27.3 per cent. ; military (Army-Navy) enlisted personnel, 25.9 per cent. ; military (Army-Navy) group (as a whole), 25 per cent. ; military (Army-Navy) officers, 23.5 per cent. ; merchant marine, 23.1 per cent. ; Army, 22.9 per cent. ; colored females (all in low economic-social status), 19.6 per cent. ; white males, 17.9 per cent. ; whites (male and female), 15.8 per cent. ; mentally sound group or, at least, cases of minor derangement and not under prolonged hospitalization, 15.3 per cent. ; females (white and colored), 15 per cent. ; persons of low economic-social status (all races), 14.6 per cent. ; (average of all groups, 13.67 per cent.) ; males (white, colored, and one Mongolian), 13.2 per cent. ; groups associated with land (excluding extensive travel by sea), 12.6 per cent. ; civilian group (as a whole), 11.8 per cent. ; Negroes (male and female), 11 per cent. ; persons of high economic-social status (all white), 9.6 per cent. ; white females, 8.1 per cent. ; mentally deranged group under prolonged hospitalization, 7.7 per cent. ; coloured males (all in low economic-social status), 4.2 per cent.

" The civilian population of Washington, on the basis of cases from 6 civilian hospitals only, has an indicated incidence of 14.2 per cent., and if children under 17 are disregarded the incidence is 15.4 per cent.

" In all cases the indicated correlations between incidence of trichinae and the groups examined are basically with reference to food habits as modified by such factors as occupation, education, standards of living, travel, methods of swine raising, exposure to raw or undercooked pork or protection from exposure by prolonged hospitalization.

" A consideration of the age incidence by decades indicates that, at least up to some unascertained point, there is an increased incidence with increasing age, due apparently to the fact that an increase in the time factor increases the opportunities for infection. At some unascertained point there may be a mortality factor in the form of deaths occurring at an age earlier than would have been the case had it not been for pathologic conditions persisting after recovery from trichinosis, thereby removing from the older age groups some of the positives that might otherwise have appeared there. Positive findings in recent literature indicate the advisability of examining suitable muscle tissue from very young infants and those prematurely born, for the possibility of detecting pre-natal infection with trichinae. The post-mortem study of suitable muscles from persons dying after prolonged confinement in hospitals, jails, and penitentiaries, under modern sanitary conditions precluding the eating of raw or undercooked pork, is suggested as a basis for obtaining more precise information as to the time larval trichinae survive alive in human beings, and the time required for calcification of the cysts and for the death of the trichinae. It is recommended that the microscopic examination of 1 gram of diaphragm muscle, as a press preparation and not by sectioning, be made a routine procedure in the post-mortem examinations by pathologists."

iii. " Since examinations of 1,778 cadavers at 24 hospitals in 11 places in the United States indicate an incidence of at least 12.5 per cent. of trichinae, with not 1 case out of 222 positive cases having been diagnosed as trichinosis at any time, it is evident that our knowledge of the polymorphic picture of clinical trichinosis is inadequate and that we need more information in regard to diagnosis.

"Trichinosis, as a disease, is determined by the presence of larval and adult worms in the intestine, and of larvae in the lymph, blood, lymph nodes and glands, brain, heart, voluntary muscles, and other tissues and certain cavities. The disease is conditioned by the numbers of worms present, the size of the patient, the tissues invaded, and the individual patient's physical condition, resistance, and concomitant pathologic conditions present.

"As regards numbers of worms present, we are certain that such large numbers of larvae as 1,000 per gram of muscle will produce severe clinical trichinosis, and suspect that such small numbers as one larva per 100 grams will not produce clinical trichinosis, but we have no data on which to judge intermediate degrees of infestation. Within this range of intermediate infestation there is undoubtedly a large group of cases of atypical clinical trichinosis, much larger than the group of so-called typical cases, which is unknown and unstudied.

"As regards the size of the patient, the same number of larvae in a small individual will give a higher concentration of larvae per gram, so that a given number of worms may cause, relatively, four times as much damage, or more, in one individual as they will cause in another.

"As regards tissues invaded, the wide range of tissues damaged gives rise to numerous cases in which the predominant symptoms are those of diseases of infectious sorts other than trichinosis, of heart disease, of respiratory disease terminating in pneumonia, often fatal, of meningitis and other disturbances of the nervous system, of eye lesions, and other conditions. Approximately 50 disease conditions confused with trichinosis are listed.

"As regards the condition of the individual patient, we expect the most variegated clinical picture associated with weaknesses in various organs, sometimes with death so closely correlated with the attack on one weak organ, such as the heart, that trichinosis is never suspected.

"To clarify our picture of trichinosis, especially of atypical clinical cases caused by infestations of intermediate extent, as opposed to very heavy or very light infestations, calls for much research and co-operation by pathologists, clinicians, and parasitologists. Quantitative studies are especially necessary.

"The various laboratory aids in diagnosis are noted, and their limitations pointed out."

C. L.

MAIER (Conrad). Zur Kenntnis der Trichinose. [On an Outbreak of Trichinosis.]—*Schweiz. Med. Woch.* 1937. Mar. 20. Vol. 67. No. 12. pp. 248-250. With 3 figs.

A small epidemic of trichinosis, affecting five persons seen at the hospital of a Swiss Canton is described, the diagnosis being established by excising muscle. In three of them an antigen skin test was positive. In one there was a condition of heart block. Eosinophils lay between 8 and 32 per cent. But in another man with chronic muscular pains and an eosinophil rate of 4 per cent., excision of a piece of biceps showed trichinosis.

C. L.

BEARUP (A. J.). A Search for *Trichinella spiralis* in Cadavers in Australia.—*Med. J. Australia.* 1937. Apr. 3. 24th Year. Vol. 1. No. 14. pp. 504-505.

"1. Microscopic examinations of 119 cadavers in Australia for *Trichinella spiralis* resulted in three positive results being obtained.

"2. In each case the progress of calcification and the microscopic appearance of the larvae indicated that the infections were not recent. They were probably acquired outside Australia."

The men had come to Australia 72, 40 and 58 years earlier. The first and second had not left it again, the third's later movements were unknown.
 "3. No case of *Trichinella spiralis* in man or animal has yet been shown to have originated in Australia."
 C. L.

CH'IN (Yao-Ting). *Trichinella* Infection in a Cat in Mukden.—*Chinese Med. Jl.* 1937. Apr. Vol. 51. No. 4. pp. 500-501. With 3 figs. on 1 plate.

In reporting trichinella infection in the tongue of a cat in Mukden (the rest of the animal had long since been destroyed), Ch'in takes the opportunity of correcting the statement of FAUST (1929) that "neither pigs nor rodents have thus far been found infected in China, thus refuting the theory that the disease was introduced into Europe with the Chinese pig (1820-1830)," seeing that MANSON reported it in Chinese pork in the China Imperial Customs Medical Reports of 1880-81.
 C. L.

SCHEIFLEY (Charles H.). *The Localization of Trichinella spiralis in the Muscle of its Host.*—*Amer. Jl. Hyg.* 1937. Mar. Vol. 25. No. 2. pp. 349-353. [13 refs.]

In 5 bitches the entire left lumbar sympathetic chain and ganglia were removed and 4 months later they were fed on trichinous meat. Although, as measured by HERRICK, ESSEX and BALDES, the flow of blood in the left hind leg would thereby be doubled, the numbers of trichinae in that limb were not increased. As usual they were greatest in the diaphragm.
 C. L.

KREIS (Hans A.). Die Entwicklung der Trichinellen zum reifen Geschlechtstier im Darne des Wirtes. [*Development of Trichinella to Maturity in the Intestine of the Host.*]—*Zent. f. Bakt.* I. Abt. Orig. 1937. Feb. 16. Vol. 138. No. 5-6. pp. 290-302. With 8 figs.

These results were got by killing rats at 2-hourly intervals up to 36 hours and thereafter at 12-hour intervals up to 240 hours after they had had an infective meal.

Female worms grow more quickly than males, the sexes are first distinguishable when the male papillae form at 18 hours, but by working back the first statement is substantiated. The females possibly undergo 4 ecdyses at these hours: 2 to 8, 12 to 16, 48, which is after copulation has taken place, and 72 which is before embryos have developed. The males show 2 ecdyses before the sexual shape is taken and a third at 20 hours.
 C. L.

MATOFF (Konstantin) & WAPZAROWA (Mara). Wieviel Jungtrichinellen kann eine weibliche Darmtrichinelle gebaren? [*How many Young Trichinae can an Intestinal Female Trichinella bear?*]—*Ztschr. f. Infektionskr. d. Haustiere.* 1937. Vol. 51. No. 2. pp. 89-98.

The authors conclude that the question in the title should have been "How many measles appear in muscle when there is a single female in the intestine?" The answer is that when only 2 measles were given to each of 23 mice there was development of muscle trichinosis in 8 only [presumably because only in a third of the cases they were male and female] and in them the number of larvae found in muscle

varied from 2 to 507, mean 315. Apart from the mouse with 2 the lowest number was 230 ; so that presumably all born do not necessarily grow to infectivity. C. L.

ITYENGAR (M. O. T.). **Public Health Aspects of Filariasis in India.**—*Indian Med. Gaz.* 1937. May. Vol. 72. No. 5. pp. 300-307. With 1 map & 7 figs.

"The present position in India is that we have not the accurate data on filarial endemicity in different parts of India to enable us to compare conditions in one area with those of another. Filariasis is a widespread disease in India and, although cases of death due to filariasis are rare, the extent of incapacitation and of sickness due to it is very large. No one seems to have ever attempted to estimate the number of persons suffering from filariasis in India.

"The respective distribution in India of the two filaria infections, *Filaria malayi* and *Wuchereria bancrofti*, has not been adequately surveyed. This information is of considerable public-health importance because measures for the control and prevention of the disease to be undertaken in *F. malayi* areas are entirely different from those to be employed in *W. bancrofti* areas. The control of the spread of *F. malayi* infection through the clearing of *Pistia* from ponds and other water collections carried out in Shertalai taluk mentioned previously has been successful and should commend itself to other areas with similar conditions. This type of control work is perhaps the first of its kind.

"The position in regard to the control of filariasis in India is very disappointing. There is very little work done in India on the control of this disease which maims a large number of persons and causes considerable suffering. While it is nearly impossible to cure filariasis, it should be easy to control the spread of the disease through suitable measures, especially as the disease is restricted to comparatively small areas." C. L.

O'CONNOR (F. W.) & BEATTY (H. A.). **The Abstraction by *Culex fatigans* of *Microfilaria bancrofti* from Man.**—*Jl. Trop. Med. & Hyg.* 1937. May 1. Vol. 40. No. 9. pp. 101-103. With 1 chart.

Further evidence is given to show that *C. fatigans* can abstract at a single blood meal many more *Microfilaria bancrofti* than may be abstracted in the same quantity of blood by mechanical means.

Culex fatigans and *Aedes aegypti* each take about 1 cmm. of blood at a feed. When left inside a mosquito net for two hours with a man, the numbers of microfilariae in his blood and of larvae in these mosquitoes were as follows :—

Hour	Micro-filariae in 1 cmm. of man's blood	Larvae in	
		<i>C. fatigans</i>	<i>A. aegypti</i>
6 to 8 p.m. ...	8.35	1 to 17, mean 8.8	0 to 6, mean 2
8 „ 10 „ ...	13.75	21 „ 372, „ 146.5	3 „ 8, „ 5.3
10 to midnight ...	8.9	10 „ 183, „ 56.7	3 „ 81, „ 42.0
Midnight to 2 a.m. ...	6.55	9 „ 738, „ 193.2	5 „ 21, „ 9.75
2 to 4 a.m. ...	6.8	15 „ 516, „ 108.1	0 „ 16, „ 7.0
4 „ 6 „ ...	4.9	10 „ 55, „ 38.9	3 „ 53, „ 23.5
6 „ 8 „ ...	0.1	4 „ 21, „ 14.75	0 „ 1, „ 0.5

When 5 *Culex* were allowed to feed all night on this man, the numbers of embryos in them were between 79 and 268, mean 170. In dissection of 2,800 wild *C. fatigans* more than 100 larvae were found in 9 of them; in 360 wild *A. aegypti* infection was more often found but was slight, 4 to 6 parasites as a rule with a maximum of 81. In considering the greater weight of infection in *Culex*, chemotaxis, the size and depth of penetration of the mouth parts of the mosquito and the entanglement of microfilariae in them are considered but not the relative losses of the parasites per anum in different individuals and species of mosquitoes nor the possibilities of multiple feeds after blood has been so passed.

C. I.

VAN DER HEIJDE (C. G.). Samenvatting van een onderzoek naar microfiliariadragers onder de Chineesche arbeiders bij de Bankatin-winning op Banka. [*Investigation of Microfilaria Carriers among Chinese Coolies of Banka.*]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. May 25. Vol. 77. No. 21. pp. 1288-1297. With 3 maps.

Examination of coolies enlisted for the tin mines of Banka, an island in the Netherlands Indies, showed that 2.5 per cent. were carriers of microfilariae. It was the new arrivals from China and especially those from the province Kongtoen who were infected. Coolies enlisted from the Chinese who had been resident for two years or more in Banka were not infected to the same extent. All the microfilariae were of the species *malayi*. No evidence was forthcoming that infection with microfilariae was associated with a greater sickness rate or a lessened work rate in infected than in non-infected coolies.

W. F. Harvey.

LANE (Clayton). **Bancroftian Filariasis and the Reticulo-Endothelial System.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 61-80. With 4 figs. (2 on 1 plate). [42 refs.]

MANSON held the view that microfilariae, in filariasis due to *Wuchereria bancrofti*, retired to the large vessels and lungs diurnally, and emerged therefrom nocturnally. His observations on the classical case in which he recovered large numbers of larvae in these situations led him to this belief. This case was one in which death resulted from cyanide poisoning; the post-mortem was performed six hours after death. Manson's findings led him to fallacious deductions owing to the current lack of knowledge of post-mortem lymph flow. Because large numbers of larvae were found in the large arteries six hours after death it did not mean that they were there ante-mortem. Clayton Lane has already expressed his belief that microfilariae possess no mechanism by which they can maintain themselves in the current in the large vessels.

Microfilarial periodicity may be likened to a tidal phenomenon. It is attributable to two entirely separate and distinct mechanisms. The rising tide is due to regular synchronous parturition of the fertile female worms; the falling tide is caused by the immobilization and destruction of the liberated microfilariae by the reticulo-endothelial system. Anatomical studies by O'CONNOR and others support the explanation of the mechanism of the first part of the cycle. In this paper, numerous observations by various workers are put forward and correlated to account for that of the second.

When helminths enter animal tissues the motile cells of the reticulo-endothelium actively assail them. The presence around worms of these cells—giant cells, endothelial cells, fibroblasts, etc.—has been noted for many years, but their significance has been missed. They actively attack and destroy the larvae in the lymph nodes before they can reach the blood. By their accumulation at these sites and final development into fibroblasts they cause lymphatic obstruction, and a condition then favourable to further fibroblast formation and of elephantiasis with or without lymphangitis. Lymphangitis is liable to occur owing to the favourable medium provided for infection, and when it does occur leads to yet further fibroblast formation.

There is evidence of complete destruction of microfilariae for months or years before any at all reach the circulatory blood. Eventually the barriers, in the form of lymph nodes, are by-passed; but the number of circulating microfilariae is no measure of the number actually born, and still less so of the number of female worms. There is a lag of 10 or 12 hours between the birth of the larvae and their appearance in the blood. This is due to their slow carriage by the lymph current, and to some extent it is dependent on the site of the mother worm and the consequent extent of the body defence to be pierced before the circulation is reached. Microfilariae found in the circulation during the period of low tide may be due to mis-timed parturition by individual female worms, or to fatigue and partial or complete blocking of the reticulo-endothelium.

Massive destruction of microfilariae in the human body has been held to be impossible, as it would produce severe reaction of the type of protein shock. This is not the case, as has been demonstrated by several workers when inoculating, experimentally, large numbers of larvae. The anatomical evidence of massive daily microfilarial destruction by the reticulo-endothelial system is so far scanty—it has not been sought extensively or systematically. Clayton Lane states that the whole subject of microfilarial periodicity requires full, detailed and unbiassed examination, and indicates certain lines along which he considers such inquiry might profitably be pursued.

This important paper covers such a field in anatomy, physiology, pathology and other subjects pertinent to its theme that it is impossible to give other than a general résumé of the main points. It should be consulted in the original by those interested in this subject.

A. R. D. Adams.

KARIADI. Aanteekeningen over filariasis. [Notes on Filariasis.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. Apr. 13. Vol. 77. No. 15. pp. 912-921. With 1 map & 2 charts.

A survey of the conditions existing on the coast of North New Guinea was made by the author as regards filariasis. Parasite carrier indices of 41, 42 and 14 per cent. were found for males, females and children respectively. This low index for children as compared with adults is ascribed to the time which it takes for the appearance of embryo filariae in the peripheral blood, in conjunction with the long duration of development of larvae to the mature sexual form. The filariasis of this region was found to be due to *Wuchereria bancrofti*. An interesting experiment was made to determine approximately the best time to examine the blood in order to detect the presence of microfilariae. Six persons were examined by a thick drop-method,

each at the hours of 10 a.m., 1 p.m., 4 p.m., 7 p.m., 10 p.m., 1 a.m., 4 a.m., and 7 a.m. with the result that for these six persons a total of 9, 0, 22, 176, 472, 482, 382 and 58 parasites respectively was found in a measured amount, 25 cmm. of blood. It may be concluded that the maximum number of microfilariae was present between 10 p.m. and 4 a.m. [thus agreeing with earlier investigators] and that examinations conducted at 7 p.m. or even 7 a.m. have a good prospect of finding the embryos required to make the diagnosis positive. It was found that an index estimation even as late in the day as 8.30 a.m. was none too bad.

W. F. Harvey.

ELSBACH (E. M.). *A. barbirostris Bancrofti* als overbrenger van filaria Bancrofti. [*A. barbirostris bancrofti* as Vector of *W. bancrofti*.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. June 22. Vol. 77. No. 25. pp. 1536-1543.

The investigation relates to New Guinea, and it appears that there the malaria carrying mosquito, *A. barbirostris bancrofti*, also transmits *Wuchereria bancrofti*.

In the natural state filarial larvae were found in mosquitoes in all stages of development, even in one and the same mosquito, so that infectivity would persist for some time. Microfilariae were sought for in the peripheral blood about 10 p.m. Infection of inhabitants of the kampongs examined worked out at about 10 per cent. The natural infective mosquito index for a total of three months was 10.9 per cent. As regards the estimation of the artificial infective mosquito index, one of the first difficulties encountered was to get even such an anthropophile mosquito as *A. barbirostris bancrofti* to bite the volunteers who presented themselves. Apparently the mosquito was easily frightened. Success was finally obtained by administering a narcotic to the human test subjects within the mosquito curtains into which mosquitoes had been liberated. Even then difficulties were met with. The artificial index, as determined in one experiment with 20 anopheles mosquitoes that had sucked blood, was 35 per cent. Not a single culicine mosquito had been infected. Mosquitoes were examined as they died after having sucked blood. One remained alive for eight days, but was negative as regards filarial infection. One mosquito, however, remained alive 148 hours and showed not only the sausage type of worm in the thorax but four mature larvae; four mature forms were also found in the head and two in the proboscis ready to make their exit. It is obvious then that a single mosquito can infect one person after another. In all the experiments the artificial infective index was higher than the natural and the longest duration for which the mosquitoes could be kept alive was 14 days. This is an important finding, for it is known that *Microfilaria bancrofti* can attain full development in 6 to 8 days.

W. F. Harvey.

ABE (S.). Development of *Wuchereria bancrofti* in the Mosquito *Culex quinquefasciatus*.—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1937. Mar. Vol. 36. No. 3 (384). [In Japanese pp. 483-515. With 55 figs. on 5 plates & 1 text fig. [24 refs.] English summary pp. 516-519.]

A detailed description of the anatomy and developments of the larva of *W. bancrofti* while in *C. quinquefasciatus* at a temperature of 25°-28°C., infectivity being reached after 15 days. Of the two ecdyses

one allows larval escape by the separation of a cap at the anterior end, the other by a split about its middle. Of the "genital cell" only the most anterior (G 1) is really so, the other three go to make a ring between the mid and hind guts. The 55 drawings give the cell arrangements a striking symmetry and simplicity and are fully described in English. C. L.

ARCHIV FÜR SCHIFFS- UND TROPEN-HYGIENE. 1937. Mar. Vol. 41. No. 3. pp. 349-350.—*Filaria bancrofti* in Abessinien [LÜDERS (H.)]. [Infestation with *W. bancrofti* in Abyssinia.]

Lüders writes that he has found *Mf. bancrofti* in the urine of a patient at Bedelle in Abyssinia [who presumably was a local man].

C. L.

SANNER (A.), DESTRIEATS & ALBRAND. Hématochylurie datant de dix ans chez une réunionnaise. Présence de *Wuchereria bancrofti* dans le sang. [Ten Years' Chyluria in Réunion in One with *Mf. bancrofti* in the Blood.]—*Bull. Soc. Path. Exot.* 1937. Jan. 13. Vol. 30. No. 1. pp. 109-112.

Intermittent chyluria had been present in this man for 10 years and *Mf. bancrofti* was found, evidently in small numbers in the blood.

The urine was salmon coloured, opalescent, with many red cells, with renal epithelium and crystals of calcium oxalate, but no microfilariæ. The percentage of fat was 2.3, of cholesterine 0.1, sugar 0.7, albumin 1.1, acetone and diacetic acid 0. The blood, apart from the few microfilariæ, showed red cells 4,500,000, haemoglobin to Tallqvist 25; and of 3,600 leucocytes 2.5 per cent. were eosinophils. There were no other symptoms, apparently, of Bancroftian filariasis. C. L.

LANE (Clayton). [Lymphangitis and Filariasis in the West Indies.] [Correspondence.]—*Jl. Trop. Med. & Hyg.* 1937. Apr. 15. Vol. 40. No. 8. p. 100.

A leading article having commented on O'CONNOR's paper [this *Bulletin*, 1937, Vol. 34, p. 460] stressing the difficulty of defining the parts played by *W. bancrofti* and the β -haemolytic streptococcus in causing the lymphangitis of Bancroftian filariasis, Lane cited the Boston work by DRINKER and his colleagues as proof that elephantiasis makes for greatly increased susceptibility to this bacterium (in their experiment a four million increase) and such infection and inflammation in turn increase the elephantiasis. As to the work by DRINKER and his colleagues at Harvard University and that by O'CONNOR and his at Columbia University, Lane adds "During the last three years the work initiated in that 200-mile strip of North American coast has laid tropical medicine under a very great debt." C. L.

ADVIER (M.) Note sur la lymphangite endémique et son traitement à la Guadeloupe. [Endemic Lymphangitis and its Treatment at Guadeloupe.]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 359-361.

In the endemic lymphangitis of Guadeloupe, microfilariæ have been found in the blood with no greater frequency than among those who

do not get these recurrent attacks, but on the other hand at the moment of the attack of fever a pure culture of a streptococcus has been got from blood and lymph. The treatment found useful has been twofold: first, immediately the attacks come on septazine (benzyl-amino-benzene-sulphamide) three doses of 0.5 gm. a day each for 3 days is believed to have shortened attacks; and then for prevention an anti-streptococcic vaccine in 6 injections given twice yearly. C. L.

MORALES-OTERO (P.) & POMALES-LEBRÓN (A.). Formación de antiestreptolisinas y antifibrinolisinás después de los ataques agudos de linfangitis tropical recurrente. [Formation of Antistreptolysins and Antifibrinolysins after Attacks of Tropical Lymphangitis].—*9a Reunión Soc. Argentina Patol. Regional, Mendoza, 1, 2, 3, y 4 octubre 1935.* Vol. 2. pp. 854–868. With 4 graphs & 1 fig.

This article is of particular interest to those who maintain that streptococci play a part in recurring tropical lymphangitis and elephantiasis. The authors show that soon after the first attack of this lymphangitis there is developed a high grade of antifibrinolytic and anti-streptococcal potency in the blood and they conclude, in conformity with the views of TODD, COBURN, TILLET and GARNER that such attacks of lymphangitis are always preceded by an infection with *Strept. haemolyticus*.

H. H. S.

BOURGUIGNON (G. C.). Un cas d'hépatite aiguë mortelle avec localisation massive de *Microfilaria perstans* dans le foie. [Acute Fatal Hepatitis associated with Large Numbers of *F. perstans* Embryos].—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 1–5. With 2 plates.

The author's expressed intention is simply to record a massive localization in a deep organ of a parasite whose normal habitat is the blood.

A native soldier at Elisabethville was admitted to hospital with violent hepatic colic and with uncontrollable bilious vomiting coming on suddenly after a meal. He died two days later. In view of talk of poisoning an autopsy was ordered and the liver was found strikingly enlarged and jaundiced, the only lesion apart from pulmonary congestion. The liver was crammed with microfilariae, much search disclosed in a section a whole one with a length of 151μ and with the characteristics of *Mf. perstans*. Microphotographs, drawings and original preparations were sent to WENYON and HOARE who reported "The liver shows areas of necrosis which appear to be of bacterial origin; in sections numerous microfilariae are present, but they do not seem to be responsible for the condition observed." There were no microfilariae in the congested vessels of the lungs, nor had any been seen in blood taken from this man on two occasions while he was in hospital. The author's view seems summed up in a sentence; the necrotic areas, the general state and the secondary lung condition are in favour of septicaemia and do not allow of any pathogenic rôle being given to *Mf. perstans*. [From the author's note that the invasion of the liver by microfilariae was probably recent it seems fair to conclude that no degeneration was detected in them.] C. L.

TESCH (J. W.). Over Filariasis en Elephantiasis bij een geïmporteerde Javaansche bevolking in Celebes. [*Filariasis and Elephantiasis in an Imported Javanese Population in Celebes.*—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. June 15. Vol. 77. No. 24. pp. 1434–1461. With 1 sketch map and 2 diagrams. English summary.

The comparison is made of a population of Javans found in the midst of the island population of Celebes. The district was one which comprised coast land, plateau and mountain. In the native area kampongs were grouped according to the prevalence of microfilariasis and elephantiasis. It was found that with percentage indices for filariasis of 0–5, 5–10, 10–20, 20–35, 35–50, 50 and over, the percentages of elephantiasis were 0·2, 0·4, 0·6, 1·1, 2·7 and 4·7 respectively. There is thus a positive correlation between filariasis and elephantiasis. All the infections were of *Microfilaria malayi* and any *bancrofti* met with was imported. A peculiarity of the infection with *malayi* seems to be that the associated elephantiasis is of the legs and not of genitalia or scrotum. The filarial periodicity was purely nocturnal and, as is usual in these infections, it was very exceptional to find any microfilariae in the blood of sufferers from elephantiasis.

Special consideration was given to the colony of Javans, mainly from mid-Java, which differed somewhat in the relation of elephantiasis to filariasis from the indigenous population. Briefly stated this difference consisted in a higher proportion of elephantiasis and a lower filariasis index for the Javans. Both filariasis and elephantiasis of course increase with increase of age. Thus for ages, 0–5, 5–10, 10–20, 20 and over, the filariasis percentages were respectively 9·9, 15·6, 21·5, and 31·8, while the corresponding percentages of elephantiasis were 3·3, 7·8, 7·7 and 25. There is thus distinct increase in the indices of filaria and elephantiasis "with the length of the period of exposure to infection." From the fact that elephantiasis among the Javanese born in the colony was less than that of those who had been brought over as adults from Java, it is concluded that the adult coming freshly into the highly endemic area is the more likely to develop the elephantiasis sequel to filarial infection than the country-born.

W. F. Harvey.

BRUG (S. L.). De overbrenging van *Filaria malayi* te Kalawara (o.a. Paloe, Res. Menado). [*The Transmitter of F. malayi in Kalawara (Celebes).*—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1937. June 15. Vol. 77. No. 24. pp. 1462–1470. With 1 diagram. English summary.

"In Kalawara (Paloe Division, Celebes) *Anopheles barbirostris* was found to be the only carrier of *Filaria malayi* and an excellent one. The artificial infection-index was 99 per cent. Development of the worm in the mosquito was completed in 8½ days, sometimes after 6½ days, mature larvae were seen in the head. In mosquitoes sectioned after 9½ and 10½ days not a single immature larva was seen. The natural infection-index was 8·1 per cent., about half of the naturally infected mosquitoes containing mature larvae. Whereas in other parts of the Malay Archipelago, *A. barbirostris* rarely attacks man, in Kalawara and Mamoedjoe (Celebes, cf. JURGENS, 1932) it readily sucks human blood. *A. bancrofti*, generally recorded as very anthropophilous, was found in fair numbers in a cow-shed, but did not seem to attack man in Kalawara."

GALLIARD (Henri). Un parasite de l'homme, nouveau pour l'Indochine *Filaria malayi* Brug 1927. [*Microfilaria malayi* reported in Man for the First Time in Indo-China.]-*Bull. Soc. Méd.-Chirurg. Indochine*. 1936. Oct. Vol. 14. No. 8. pp. 1091-1093.

Microfilaria malayi has been reported east and west of Indo-China. In 170 patients in hospital, none of whom had symptoms of filariasis, there were microfilariae in the blood of 22, all *Mf. malayi*. It is confirmed that *C. fatigans* could not be infected from this microfilaria.

C. L.

ROUBAUD (E.) & COLAS-BELCOUR (J.). Nouvelles recherches sur l'évolution expérimentale de *Dirofilaria immitis* chez quelques culicides indigènes. [New Work on the Development of *D. immitis* in Culicines in France.]-*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 480-484. With 1 fig.

Anopheles maculipennis plays the predominating rôle, *Aedes punctor* and *Aedes geniculatus* are occasionally infected, but in *Anopheles plumbeus* development does not seem to go on to infectivity. C. L.

ROUBAUD (E.). Nouvelles recherches sur l'infection du moustique de la fièvre jaune par *Dirofilaria immitis* Leidy. Les races biologiques d'*Aedes aegypti* et l'infection filarienne. [*Dirofilarial Infection in Aedes aegypti* as affected by its Biological Race.]-*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 511-519. With 1 fig.

Dirofilaria immitis develops unequally well in different biological races of *Aedes aegypti*, and in the race least complacent of parasitism, that from Cuba, the microfilariae from different dogs also develop unequally well. C. L.

- i. AUGUSTINE (Donald L.). Description of a New Filariid from Ground Doves of St. Croix, Virgin Islands.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 47-54. With 9 figs.
- ii. ——. Observations on Living "Sheathed" Microfilariae in the Capillary Circulation.—*Ibid.* pp. 55-60.

i. *Vagrifilaria columbigallinae* n.g., n.sp. from the blood vessels (peritoneal, splenic, pancreatic, pulmonary) and from the auricles and ventricles of the heart is of importance to tropical medicine in that it has a sheathed microfilaria closely resembling *Mf. bancrofti* and that it has already been used (*vide* ii.) to clear up points in the behaviour of the latter in the circulation. A single bird often harbours 26 to 36 adult worms (male about 13 mm. long; females 20 to 23 mm.) and the microfilariae in enormous numbers are present at all hours, but apparently mostly at night. Adults and larvae are described in detail and the systematic position is considered.

ii. In effect this work is the result of the reviewer's comment on the behaviour of the sheathless *Mf. immitis* in the blood circulation which was reported by Augustine, FIELD and DRINKER (this *Bulletin*, 1937, Vol. 34, p. 35). Working with Professor F. W. O'CONNOR in the United States Virgin Islands, the sheathed microfilariae of *V. columbigallinae* and of *Wuchereria bancrofti* were injected into the frog, *Rana*

pipiens, local bats having too much pigment for their wing capillaries to be clearly seen. Into the abdominal vein of a frog anaesthetized with urethane the microfilarial blood was injected. In a typical experiment with *Mf. columbigallinae* 0.3 cc. of heparinized dove blood, heavily infected, was injected at 11.05 a.m. and the web of a foot mounted for observation by a water immersion lens. The condition seen 45 minutes later was this:—

" 11.50 a.m. Numerous, exceedingly active, microfilariae observed travelling with and against blood stream in capillaries and in larger vessels. They cross capillary net work from venous to arterial side and from arterial to venous side, back out of temporary obstructions (occlusions due to lodged white and red blood cells) seeking an avenue of escape with tail, turn about in the capillaries and proceed in opposite direction. Ten to fifteen microfilariae are frequently seen in ' nests ' (occluded capillaries). They are very active, knocking each other and the stagnated cells about in the effort to escape. Suddenly some distant barrier apparently was released and all microfilariae disappeared *en masse* into the active circulation. Contours of the vessels are not altered by movements of the microfilariae. The ' sheath ' is not seen on any microfilaria."

About five hours later their numbers in capillaries were notably fewer and 4½ hours later there was none, nor were they seen again. None was found at any time in the dorsal lymph space.

" Experiments of this type clearly show that ' sheathed ' microfilariae actively and forcibly migrate through the capillaries, all their movements having the effect of keeping them in the circulating blood. Their travel in the capillaries is as effective as that of ' unsheathed ' microfilariae."

In experiments with blood taken at night the behaviour of microfilariae showed no apparent difference. Experiments with *Mf. bancrofti* were unsatisfactory, for obtainable infections in man were light and the larvae did not survive haemolysation in the attempt to concentrate them.

" Frogs killed from 18 to 31 hours after injection with *Mf. columbigallinae* or *Mf. bancrofti* show these distributed throughout the liver but none in the other organs. They lie in the liver sinusoids and occasionally in the veins. Many appear to have been alive and active at the time of fixation—as judged by the normal position of the body nuclei, smooth cuticula, and characteristic curves of the body indicative of active progression. Others were apparently dead and showed degenerative changes—the nuclei distorted, the cuticle crumpled, and the body lacking the characteristic contours of normal microfilariae. There was no cellular infiltration.

" Livers of frogs killed 5 days after injection with microfilariae showed no organisms. There were, however, scattered throughout the liver, fairly numerous small areas of lymphocytic infiltration which may possibly represent a late reaction persisting after the disappearance of microfilariae. If such be the case, the earlier cellular response was not obtained in our limited series."

Degenerating forms were not found in other organs and the question is raised whether the liver does not merely get rid of feeble circulating forms.

No sheath was ever seen on microfilariae while in the capillaries, nor on *Mf. columbigallinae* in freshly drawn heparinized blood.

" The formation of the ' sheath ' could always be followed on the slide as the medium surrounding the larva dried. The process was repeatedly observed on *Mf. bancrofti* and *Mf. columbigallinae*. The larva is

mechanically held in the ever thickening medium. In its efforts to push on and back out, the once close-fitting, inconspicuous outer covering is continually stretched until complete drying of the preparation prevents further movement of the microfilaria, which then perishes."

As to the origin of the sheath—

"Developing microfilariae from the uterus of *Vagrifilaria columbigallinae* clearly show the vitelline membrane surrounding eggs containing coiled larvae, but none of the microfilariae from the vaginal region show any evidence of a sheath. From this same region of the uterus are found accumulations of crumpled, hyaline objects, similar in size and shape to the membranes enclosing coiled embryos taken from a higher level of the uterus. These we interpret to be discarded vitelline membranes of mature microfilariae.

"It appears, therefore, that the 'sheath' on the species of microfilariae studied is comparable to that of infective hookworm larvae—namely, the result of an incomplete ecdysis."

C. L.

MOORTHY (V. N.). **A Redescription of *Dracunculus medinensis*.**—*Jl. Parasitology*. 1937. Apr. Vol. 23. No. 2. pp. 220-224. With 14 figs. on 3 plates.

The number of dogs in which dracunculus infection has been experimentally established is now 6 [cf. this *Bulletin*, 1937, Vol. 34, p. 35] and from them 47 male and 181 female guineaworms have been got, the males from 1.2 to 2.9 cm. long, the females from 1.5 to 53. The anatomy of the sexes is described, the males having equal spicules 490 to 730 μ , and a gubernaculum, 200 μ long. The vagina contains a mucoid plug when the female has reached 24 mm. long, and since no males were found when the infection had reached an age of six months it is felt that impregnation must take place in the early months.

C. L.

JOSPIN (Y.). Note sur deux kystes à filaire de Médine à localisation rare. [**Cystic Swellings due to *D. medinensis*.**]—*Bull. Soc. Path. Exot.* 1937. Feb. 10. Vol. 30. No. 2. p. 146.

Two men from the Ivory Coast had each a tumour as big as a large almond near the angle of the scapula, moving on the deep fascia, and showing the shadow of calcification to X-rays. On excision a fibrous capsule enclosed a knotted single worm with a diameter of 1.5 mm., which proved to be *D. medinensis*.

C. L.

GALLIARD (R.) & SICÉ (A.). Les arthrites purulentes provoquées par "*Dracunculus medinensis*" et leurs sequelles. [**Purulent Arthritis due to *D. medinensis*.**]—*Marseille-Méd.* 1936. Dec. 25. Vol. 73. No. 36. pp. 724-730.

A guineaworm pointed near the knee of this girl and was extracted, as is usual locally, by tension; she was then aged 5 years. There followed suppuration of the knee joint during which the patella and bits of fascia and ligament came away; and though several times at the point of death with great wasting, she was seen, stout and well, at the age of 20, with bent knee and wasted muscles, her state being detailed.

C. L.

STRONG (R. P.). **Onchocerciasis in Central America and Africa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. Mar. 4. Vol. 30. No. 5. pp. 487-499.

In this, the first Chadwick Lecture of the Royal Society of Tropical Medicine and Hygiene, is given an account of personal experience of onchocerciasis in both hemispheres.

While in the New World ocular symptoms have been associated with onchocerciasis since its first description there by ROBLES in 1915, it was not till HISSETTE did so for the north-western Katanga Province in 1932 that the connexion was recognized for the Old; and this connexion led to the organization of Strong's expedition which by sea, rail, river, road and foot-trail reached the district most severely infected, about 5° to 6° S. and 23° to 24° E. In it are no white people at all, the inhabitants are Bantus and pigmies. In this part all those examined are infected and few of the population were not examined. In 156 ocular cases there was special study of the eyes, and in 40 of them that study was histological. While in Guatemala there was eye disturbance in 5 per cent. of those with onchocerca infection, in the village of Illebo in north-west Congo the percentage of this in its 150 inhabitants was 45, that of total blindness 10, and that of nodules on the head in those with eye damage about 62. With the presence of some microfilariae in the bulbar conjunctiva there may yet be no demonstrable lesions in the eye.

As to the terrain and the breeding of *Simulium*, there is a marked similarity in Guatemala and in this province of Lusambo in Africa—ridges with deep, steep, wooded valleys, with swift streams running at their bottoms in all of which *Simulium* breeds abundantly. As to occupation, the coffee plantations in Guatemala and the cultivation of cotton, mandioca and the collection of the piassava palm, and the almost daily collection of drinking water (and frequent bathing) in Lusambo bring workers to the fly; this in Guatemala was found infected to not more than 5 per cent., and in the village of Kassende in Lusambo to 33.3 per cent.

As to prevention, it is on infected man that attention should be concentrated in Guatemala, for excision of nodules has reduced human and fly infection there by nearly half, and there the infected areas are sharply bounded. In Lusambo with widespread infection the eradication of breeding places is the most important problem, an extensive engineering one, the species implicated being *S. damnosum* and *S. neavei*. It is believed that an onchocerca present in the eland is *O. volvulus*. Remark was made on the general lack of post-mortem examinations on infected persons.

In discussion D. B. BLACKLOCK commented on the fact that *S. damnosum* by its voracity rendered uninhabited large tracts of very fertile country. As to the cause of the limitation of nodules to the head, his experience suggested that overhead shade and a more clothed body might direct the flies there. Breeding places were not easy to attack, but clearing the ground of vegetation was promising. L. E. HURTADO laid stress on an eosinophilia of 25 to 75 per cent. and on the value of removal of nodules in improving vision. J. RODHAIN redescribed two post-mortem examinations with special reference to the occurrence of microfilariae in the liver. Dr. G. Carmichael Low and Dr. C. C. CHESTERMAN spoke of Professor Strong's other activities, and His Excellency M. Slavko GROUITCH, the Jugo-Slavian

Minister, of his work in delousing the Serbian Army during the War.

In Professor Strong's reply was this important sentence :

" May I emphasize again the desirability and importance of complete and careful observations at autopsy of all fatal cases, with preservation and histological study of the tissues. Only from such repeated studies shall we be able to learn definitely the distribution of both the adult and larval forms of these parasites."

C. L.

GIAQUINTO MIRA (Mario). Contributo agli studi sul problema della trasmissione della onchocercosi nel Guatemala. [**Contribution to the Study of the Problem of the Transmission of Onchocerciasis in Guatemala.**—*Ann. d'Igiene.* 1937. Mar. Vol. 47. No. 3. pp. 109-125. With 3 figs. [12 refs.]

In Guatemala *Eusimulium ochreatum* is the chief vector of onchocerciasis, *Simulium avidum* comes next in importance and *Eusimulium mooseri* last.

Eu. ochreatum is the only species which is typically attracted to man as a source of food and that attraction is marked ; in the endemic zone it is always present in good numbers ; and though it is not always the species present in greatest numbers, yet its preference for man as food gives it greater possibilities for infecting him than fall to the others which prefer to feed on animals ; it is the only species whose distribution coincides with that of onchocerciasis in Guatemala.

C. L.

MÜHLENS (P.). *Onchocerca volvulus* aus Kamerun. [*Onchocerca volvulus from the Cameroons.*—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. May. Vol. 41. No. 5. pp. 430-432. With 3 figs.]

A man with a 50 per cent. eosinophilia but with no microfilariae in the blood and no intestinal parasites was questioned as to nodules. There were two small ones over the sacrum, one the size of a lentil, the other of a rice grain. *Mf. volvulus* came out of a piece of excised skin taken from over a nodule and placed in saline ; and when the nodules were removed sections displayed the adult worms and teasing showed larvae and embryonated eggs. The small size of the nodules was reminiscent of those on the head in "*O. caecutiens*" infection. This man's wife too had a strong eosinophilia with no evidence of worm infection in blood or faeces, but would not allow the skin to be snipped.

C. L.

BLACKLOCK (D. B.). **Studies in Rural Hygiene in the Tropics. IV. The Place of Mass Treatment in Tropical Hygiene.**—*Ann. Trop. Med. & Parasit.* 1937. Apr. 8. Vol. 31. No. 1. pp. 141-144.

A consideration of the ethics and practice of what is at present generally termed mass treatment.

The term treatment as commonly used presupposes diagnosis. Blunderbuss treatment is the discharge of a variety of drug missiles in the hope that one will hit the target. " Mass treatment " discharges a suitable drug missile without even knowledge whether the target is there to be hit ; it is advised for two different reasons : to relieve symptoms of any possible patients ; to check spread of infection. The permissibility of such mass treatment depends on the deadliness

of the drug used ; for malaria quinine has a low toxicity and has been given in large doses without ill effect ; for hookworm infection carbon tetrachloride has produced many deaths and in such mass treatment, " the death of even a single person, who turns out after all not to have been infected, must weigh heavily in the scales against any benefits those other persons, who did happen to be infected, may have derived from the wholesale procedure." If a drug should be found which unworms with no risk to uninfected, its use, though unscientific, would meet with little objection for cure, but for prevention it leaves unaltered the basic consideration that " as long as insanitary conditions in the villages are allowed to remain such as to favour soil and similar infection, the fundamental problem remains unsolved." He quotes the good report of Dr. MANSON at Cinnemara in Assam of 800 coolies treated by tetrachlorethylene without troublesome symptoms, but with a pleasing feeling of drunkenness. [The same happy approbation was given for the same reason by coolies at Darjeeling in the reviewer's experience of some 50,000 doses of thymol given to over 20,000 persons without anxiety and with no death. In the report of MAPLESTONE and MUKERJI using D.C.F. the cure rate of tetrachlorethylene was 20·8 per cent. (this *Bulletin*, 1930, Vol. 27, p. 419).]

As to schools, if this " mass treatment " is to be carried out [is not the reviewer's " herd treatment " the proper label ?] parents must be told that their child may or may not be infected and, if not, no betterment in health may be looked for. In some schools herd treatment is an annual event, which, if reasonable, implies either failure of earlier treatment to unworm or a reasonable conviction of re-infection, or on the other hand unnecessary treatment for those who are not or perhaps never have been infected.

" We ought in these days to be able to produce a more rational and permanent solution, by an equal effort in education, directed towards teaching the people in rural areas how to provide themselves with safe latrines, and how to use and look after them. Mass treatment with dangerous drugs should be regarded as the last resort, to be sought only when mass education in hygiene has been given a thorough trial and has demonstrably failed."

C. L.

REVIEWS AND NOTICES.

KIRK (J. Balfour) [M.B., Ch.B., M.R.C.P., D.P.H., D.T.M. & H., Director, Medical & Health Department, Mauritius]. **A Manual of Practical Tropical Sanitation.**—pp. ix + 300. With 46 figs. 1937. London: Baillière, Tindall & Cox, 8 Henrietta Street, Covent Garden, W.C.2. [7s. 6d.] [Review appears also in *Bulletin of Hygiene.*]

In a foreword to this handy volume, Dr. Balfour Kirk explains that there is no moderately priced book on this subject in the English language suitable for sanitary inspectors. During the course of his work in teaching and administration he has noted the gradual lowering of the standard of work of sanitary staffs which occurs owing to the lack of a ready means of revision. The author has sought to remedy this defect by providing this short well-indexed manual.

The technical subjects discussed are preceded by thirty-five pages of preliminary matter consisting of a chapter on the cell of plant and animal, and one on the anatomy and elementary physiology of the human body, both of which are illustrated by simple explanatory diagrams. The collection of vital statistics, the use of spot maps and the general means of dealing with communicable diseases form the next sections, which are followed by a consideration of diseases spread through the agency of the excreta, such as enteric fever, dysentery, cholera, undulant fever, hookworm, bilharzia and tapeworm infections. A chapter is devoted to diseases spread by discharges from the nose and mouth, including pulmonary tuberculosis (with short sections on bovine tuberculosis and the tuberculin test), diphtheria, cerebrospinal fever, scarlet fever, lobar pneumonia, and pneumonic plague.

The elementary entomology section includes brief descriptions of the structure and life history of some important ticks, flies and mosquitoes, and the insect-borne diseases follow in a natural sequence; a chapter is devoted to miscellaneous communicable diseases.

Methods of disinfection, housing, food (with a special chapter on milk and control of milk production), water supplies, disposal of sewage and refuse are each discussed.

Balfour Kirk expressly states that in a book such as this there can be little original, except the selection of material and the style. These, however, are very important exceptions, since only practical experience can guide in the decision as to what to include in a brief manual and an obscure method of presentation might render even the most informative work uninspiring. With regard to both of these difficulties, namely, the careful selection of topics and the treatment of them in concise and simple language, the author has been highly successful.

Not only sanitary inspectors but many medical men also will find this book of good service. Estate and mine managers, engineers and others in charge of labour in tropical regions, faced as they are with problems affecting the health of their employees in circumstances where technical aid may not be at hand, will be well advised to provide themselves with this practical guide to tropical sanitation.

D. B. Blacklock.

CENTRAL COUNCIL FOR HEALTH EDUCATION. **Health Education Year Book 1937-8.**—144 pp. 1937. London: 1, Thornhaugh Street, Russell Square, W.C.1. [5s.]

THE BRITISH FILM INSTITUTE. **Supplementary Catalogue of British Medical Films of Technical Interest to Medical Practitioners and Students.** Jan. 1936-Jan. 1937.—16 pp. London: 4, Great Russell Street, W.C.1. [6d.] [Review appears also in *Bulletin of Hygiene.*]

The Year Book 1937-38 issued by the Central Council for Health Education gives in convenient form particulars of the various types of health propaganda material available for use in health education work in Great Britain. The information is grouped in seven sections, the first section outlining the aims and activities of the Central Council itself, and the following sections giving particulars of some 75 Health Associations, their addresses, principal officers, constitutions, objects and activities, with notes on their publications (journals, books, pamphlets, leaflets, etc.), their poster services, health week and exhibition services, lecture services (with a panel of lecturers and particulars of subjects and fees), and classified tables of cinematograph films and lantern slides available for use in connexion with Health Weeks and other occasions. The Year Book is likely to prove of great use to anyone engaged in health education work or in organizing a health campaign.

Medical Officers of Health and others may also find useful the lists of medical films issued by the British Film Institute. The Institute's main "Catalogue of British Medical Films of Technical Interest to Medical Practitioners and Students" appeared in 1936 (see this *Bulletin*, 1936, Vol. 33, p. 415] and described about 200 films. The Supplementary Catalogue now published gives particulars of some 100 further films relating to the pre-clinical sciences, general medicine and surgery, hygiene and public health, pathology, and special and miscellaneous subjects such as orthopaedics, paediatrics, tuberculosis, physical training, and hospital management and education.

R. L. S.

TROPICAL DISEASES BULLETIN.

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TROPICAL OPHTHALMOLOGY

A REVIEW OF RECENT ARTICLES. XXVIII.*

Eyelids.—SHIMKIN¹ described a method of internal tarsorrhaphy which he devised for the relief of paralytic ectropion—leprotic or otherwise. The portion of the lower lid medial to the lower punctum is drawn by two loop sutures into a deep pocket formed by splitting the corresponding portion of the upper lid. An area of skin below the portion of the lower lid about to be raised is first excised, and the lid margin and conjunctiva in the neighbourhood of this portion is scarified in order to secure adhesion.

Lachrymal glands.—WRIGHT and Koman NAYAR² have met with three cases of acute dacryoadenitis which they believe to have been probably caused by a Morax-Axenfeld infection. A pure culture of the diplo-bacillus was obtained from a puncture of the preauricular gland.

Conjunctiva.—The conjunctival inflammations which may occur in the late stages of an attack of bacillary dysentery are explained by FABIANI³ as being possibly caused by an allergic reaction to bacilli introduced by soiled fingers. He experimented on rabbits, using sub-conjunctivally an extremely weak solution of Shiga bacillary toxin; the next day an intravenous injection was made of Shiga toxin exactly neutralized by an antitoxic serum. Over 40 per cent. of the animals gave a definite positive reaction.

Trachoma.—The difficulties which surround the question of trachoma are exemplified by the fact that Jean SÉDAN⁴ should have thought it worth while devoting 34 pages of the *Revue Internationale du Trachome* to a discussion as to whether the disease is contagious. He concludes that trachoma is certainly contagious and that infants are specially

* For the twenty-seventh of this series, see Vol 34, pp. 491-495.

¹ SHIMKIN (N. I.). Tarsorrhaphia Medialis Vera.—*Brit. Jl. Ophthalm.* 1937. July. Vol. 21. No. 7. pp. 343-352. With 4 figs.

² WRIGHT (R. E.) & NAYAR (K. Koman). Acute Dacryoadenitis due to the Morax-Axenfeld Diplobacillus.—*Brit. Jl. Ophthalm.* 1937. July. Vol. 21. No. 7. pp. 367-368.

³ FABIANI (G.). Le rôle des phénomènes d'hypersensibilité dans la production des accidents oculaires de la dysenterie bacillaire.—*C.R. Soc. Biol.* 1937. Vol. 125. No. 21. pp. 749-750.

⁴ SÉDAN (Jean). Sur la contagion du trachome envisagée du point de vue clinique.—*Rev. Internat. du Trachome.* 1937. Apr. Vol. 14. No. 2. pp. 65-104. [4 pages of refs.]

susceptible. Infection at school is less likely to occur, but boarders are in greater danger than day-scholars. The risk of infection is considerably less during adult life. He concludes that a racial liability to the disease exists, and that malnutrition, faulty hygiene, and epidemics of conjunctivitis are predisposing factors. Trauma, too, may induce an attack of the disease. Features of the disease met with in Athens and Constantinople have been described by TRANTAS⁵. The incidence among hospital patients in Constantinople was 11·7 per cent., and in Athens 17·25 per cent. Private patients suffered less from trachoma, but more from spring catarrh. The incidence of trachoma was higher in females than in males, and those between 21 and 35 years of age were most affected. The disease was sometimes met with in an acute form independent of any secondary infection, and in 1·11 per cent. only one eye was attacked. Trachoma was found to predispose to pterygium.

CORNET⁶ remarks how easily the association of an interstitial keratitis, due to syphilis, tubercle, or other causes, may be overlooked in cases of trachomatous pannus.

In an account of the investigations in Trachoma conducted at the Madras Eye Hospital and the King Institute WRIGHT⁷ points out how difficult it is to avoid fallacies when attempting to identify the aetiological agent. He found that infective, unfiltered trachoma material when implanted on the chorio-allantoic membrane of the chick produced growths which could be sub-passaged and were sterile to ordinary laboratory media. A suspension of the growth failed, however, to reproduce the disease when implanted on the normal human conjunctiva. A variety of other agents were found to produce similar chorio-allantoic growths, but those of a chemical or mechanical nature could not be sub-passaged. Clinical experience showed that some cases of typical trachoma failed to reproduce the disease in human subjects who were proved susceptible to trachomatous material obtained from other sources. Some persons, too, appear to possess a comparative immunity. It is noteworthy that nine attempts to infect the normal human conjunctiva with filtered trachomatous material all failed.

CUÉNOD and NATAF⁸ claim to have induced a true trachoma in the human subject by the conjunctival inoculation of the intestines of lice infected by *Rickettsia* obtained from trachomatous material. Follicles appeared eight days after inoculation and gradually became generalized over the tarsal and supertarsal conjunctiva. They state "We consider that we have proved both morphologically and experimentally that trachoma is a Rickettsiosis and that the louse forms a reservoir, and is perhaps one of the vectors of trachomatous virus, and probably the principal one." The authors review their previous researches in the

⁵ TRANTAS (A.). Sur quelques questions cliniques concernant le trachome.—*Rev. Internat. du Trachome*. 1937. Apr. Vol. 14. No. 2. pp. 131–152. With 4 figs.

⁶ CORNET (E.). Pannus et keratite interstitielle.—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 403–407.

⁷ WRIGHT (R. E.). Trachoma.—*Brit. Jl. Ophthalm.* 1937. Apr. Vol. 21. No. 4. pp. 198–201.

⁸ CUÉNOD (A.) & NATAF (R.). Bacteriological and Experimental Researches on the Aetiology of Trachoma.—*Brit. Jl. Ophthalm.* 1937. June. Vol. 21. No. 6. pp. 309–315. [13 refs.]

subject. They have also published much the same account of their researches⁹ in the *Revue Internat. du Trachome* and added their conclusion that children in lousy and trachomatous families infect their fingers and nails by scratching their bites, and then inoculate their conjunctivae when they rub their eyes.

Cornea.—WRIGHT (R. E.)¹⁰ has published some valuable hints on corneal grafting for leukoma gained from his wide experience. He has found a 6 mm. trephine, used for both donor and recipient, to be the most generally useful. Anterior synechiae, which lead to opacification, are likely to follow the use of large sized trephines, and a 3 mm. trephine is too small. The recipient should, if possible, have a small pupil and a reasonably deep anterior chamber, whilst the pupil of the donor should be dilated. He uses three retaining sutures, tied across the cornea, and advocates their early removal. A cornea that has been previously vascularized by inflammation has been found a better soil for a graft than one free from such old vessels. When dealing with the graft it is most important to avoid the slightest injury to its deep surface. Descemet's membrane readily lifts, buckles, and detaches at the cut edge. In the case of large grafts eserine is preferable to atropin in after-treatment. Patients should not expect a high visual acuity to follow the operation, but uncomplicated cases are likely to acquire sufficient sight to enable them to recognize large objects and to walk unaided.

Cataract.—The causes of distress after a cataract operation were discussed by McMULLEN¹¹ in his Presidential Address at the Royal Society of Medicine. Flatulence and mental strain due to occlusion of both eyes are the chief causes of minor discomfort. The traditional system of ophthalmic nursing is partly responsible as it insists on the maintenance of strict immobility in a supine position for two or three days after operation. The author advocates an early release of both eyes and a considerable relaxation of the traditional régime. He has found the Mayou form of canvas bed-rest helpful in supporting the patient in a comfortable position.

GRAVES¹² advocates the use of general anaesthesia for cataract extraction. He uses a combination of rectal paraldehyde and hypodermic omnopon. One drachm of paraldehyde, dissolved in ten drachms of saline, for each stone of the patient's weight, is given by the rectum an hour before the operation, and the omnopon, 1/30 of a grain for each stone, is injected half an hour later. He adopts a special technique, the chief features of which are a stitch through the superior rectus to secure control of the globe, and a corneoscleral suture inserted in a peculiar way. A simple operation is done, capsule forceps being used for the removal of a portion of the lens capsule.

⁹ CUÉNOD (A.) & NATAF (Roger). Recherches expérimentales sur la contagiosité du trachome.—*Rev. Internat. du Trachome*. 1937. Apr. Vol. 14. No. 2. pp. 104–117. [32 refs.]

¹⁰ WRIGHT (R. E.). Keratoplasty.—*Brit. Med. Jl.* 1937. June 26 pp. 1311–1312.

¹¹ McMULLEN (W. H.). Post-Operative Distress in Cases of Senile Cataract.—*Brit. Jl. Ophthalm.* 1936. Dec. Vol. 20. No. 12. pp. 657–666. With 1 fig.

¹² GRAVES (Basil). Technique of Cataract Extraction during Narcosis.—*Brit. Med. Jl.* 1937. Aug. 14. pp. 319–321. With 11 figs.

TSANG¹⁸ has analysed 1,000 cases of eye disease which he treated in Shanghai. Diseases of the eyelids predominated, with an incidence of 34 per cent. Styes and chalazion were commonly met with, and malnutrition played a large part in their causation. Trachoma, too, with its complications is prevalent in the district. Senile cataract is said to be fairly common, though less frequent than in Canton. The proportion of people who reach old age is comparatively low and Chinese psychology tends to reduce the number of those who seek relief. Glaucoma has about the same incidence as senile cataract.

H. Kirkpatrick.

¹⁸ TSANG (F. S.). Ophthalmic Surgery among the Chinese with a Brief Study of 1,000 Cases.—*Chinese Med. Jl.* 1937. July. Vol. 52. No. 1. pp. 53-68.

LEPROSY.

MAXWELL (James L.). **A Statistical Review of 1,379 Cases of Leprosy in China.**—*Internat. Jl. Leprosy.* Manila. 1937. Apr.–June. Vol. 5. No. 2. pp. 151–157.

In this paper Dr. Maxwell adds to his former contributions to the subject an analysis of information obtained from medical men through a questionnaire regarding 1,379 cases of leprosy. The sex incidence was 3·8 males to 1 female, an excess of males due to their coming more for treatment, for the ratio among infected parents was only 2 to 1. After allowing 4 to 5 years for the incubation period the estimated age of infection was from 0 to 19 years in 56·6 per cent., and only 19·6 per cent. in those over 30 years of age. The period elapsing between the appearance of the first symptoms and their coming to clinics for treatment showed the disappointing fact that only 19 per cent. came in the first year of the disease, and 45 per cent. had been infected for over five years, and 19 per cent. for over 10 years before coming for treatment; a sufficient reason for the depressing reports of failures sometimes met with. The site of the first noted lesion was on the buttock or lower extremity in 35 per cent., on the face in 25 per cent. and on the upper extremity in 23·7 per cent. Not quite one-third admitted family infection. Of 712 examined bacteriologically, 523 were positive. Other members of the family infected were father or mother in 140 cases, brothers and sisters in 120, children in 18, other near relatives in 158, and none in 897 out of 1,333 noted. Information on the types of the disease was unreliable. He concludes: "Great stress should be laid on the appalling delays before patients come for treatment, which reduces enormously their prospects of cure."

L. Rogers.

SANTRA (I.). **Leprosy in the Eastern States Agency.**—*Leprosy in India.* 1937. Apr. Vol. 9. No. 2. pp. 54–58.

This paper is mainly of local interest in showing considerable prevalence of leprosy in the India Tributary States of Orissa and the East of the Central Provinces of India. An interesting point is that cases of yaws were found to have been incorrectly diagnosed as leprosy and isolated outside the villages. The incidence was 0·64 per mille. Uninfective chronic nerve cases were also sometimes isolated. L. R.

LOWE (John). **The Epidemiology of Leprosy. A Brief Outline.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1937. June. Vol. 1. No. 1. pp. 56–61.

— **The Epidemiology of Leprosy.**—*Leprosy in India.* 1937. July. Vol. 9. No. 3. pp. 81–92. With 2 maps and 4 graphs.

These two notes deal with the subject briefly on the usual lines. The second one gives sketch maps of the world and of India distribution. In it he stresses the encouragement of the wanderings of possibly infective lepers through the religious support of giving alms to beggars, and also points out the danger of infections through "the joint family system" under which a father and mother and all their married sons and their families, and all unmarried children, share one household. [The same applies to tuberculous infections among the Hindus.].

L. R.

DE SOUZA ARAUJO (H. C.). A lepra e as organizações anti-leprosas do Brasil em 1936. [**Leprosy and Measures for dealing with the Disease in Brazil.**—*Mem. Inst. Oswaldo Cruz.* 1937. Vol. 32. No. 1. pp. 111–160. With 1 folding map.

This article cannot be summarized or abstracted, but is a record of a piece of work which should prove of much value for reference. The author has got together the returns for the past century and more of lepers in the different States of Brazil, taking each in turn, giving the numbers and showing how they have increased and brief accounts of the various organizations which have been established from time to time for dealing with the disease. Official returns for 21 States gave 7,224 in 1923, and 12,730 in 1927; seven years later there were 26,296 in 19 States and in 1936, only two years later, 30,754 in 21 States. According to the author's estimate these figures are too low. He gives for 22 States, 24,000 in 1924; 40,000 in 1933 and 48,440 (in place of 30,754) in 1936. H. H. S.

SACRAMENTO (A. Azevedo). Resumo estatístico sobre 10,369 casos de lepra. [**Statistical Summary of 10,369 Cases of Leprosy (in São Paulo).**—*Brasil-Médico.* 1937. Apr. 17. Vol. 51. No. 16. pp. 478–489. With 6 graphs.

This analysis of over ten thousand cases of leprosy in São Paulo is presented in the form of graphs and tables, giving the nationality, age, sex and occupation of the patients. The following are the main conclusions:—

Whites are much more attacked than the coloured, 90.5 per cent., and males preponderated in the proportion of about three to two (61.4 and 38.6 per cent.). Foreigners and their children constitute more than half of the patients, 54.2 per cent., or in actual figures, 2,410 foreigners and 3,207 of their children. Italians head the list (40.6 per cent.), then Portuguese (6.3) and Spaniards (3.8). The disease is commonest in the urban centres and in the poorer and most thickly populated quarters. Clinically, the mixed form is most often seen. As regards age, the disease in Brazilians is mostly in those under 30 years, in foreigners over 30 years. H. H. S.

SOARES (José Augusto). Epidemiologia da lepra no sul do estado do Espírito Santo. (Analyse de algumas observações.) [**Epidemiology of Leprosy in the State of Espírito Santo.**—*Rev. Brasileira Leprologia.* S. Paulo. 1937. June. Vol. 5. No. 2. pp. 159–191.

As regards a contribution to epidemiology this paper is of local importance only since the cases were but few, only 109 altogether, and in this total are included 50 known before 1935 and 12 in the dispensaries. Forty-seven new cases were discovered in 1935; fourteen of these were in Alegre municipality, the next being João Pessoa with ten; nine others together had only 24. Including new and old, 47 of the 109 were in Alegre, 13 in João Pessoa and the same in Muguy. The author deals with the different forms and types of disease, age, sex and race, but with so small a total such data are of no real significance. H. H. S.

PALDROK (A.). Bedeutender Rückgang der Lepra in Eesti. [**Decrease of Lepers in Esthonia.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. June. Vol. 41. No. 6. pp. 439-443. With 2 figs.

This further note by Dr. Paldrok on leprosy in Esthonia is mainly of local interest. He states that the cases have decreased from 236 in 1926 to 174 in 1936. L. R.

DUMITRESCO (Nistor). Contributions à l'épidémiologie de la lèpre. [**Leprosy in Rumania.**—*Bull. Acad. Méd. Roumanie.* 1937. 2nd Year. Vol. 3. No. 3. pp. 341-347. With 2 figs.

The author deals briefly with two foci of infection in Rumania with 21 cases seen since 1934. He traces the infection of four children from a woman aged 60, with an incubation period of 4 to 5 years in three of them and five infections from the other centre, but no conjugal infections. L. R.

VAN BREUSEGHEM (R.). Lèpre et sangsues. [**Leeches as Transmitters of Leprosy.**—*Ann. Soc. Belge de Méd. Trop.* 1937. June 30. Vol. 17. No. 2. pp. 237-244.

The author reports his observations on the possibility of leeches playing a part in the dissemination of leprosy in marshy regions of the Belgian Congo. He first investigated the likelihood of leeches containing acid-fast bacilli under natural conditions and only found them in three of 165 leeches examined in region of the head, the middle of the body and the caudal end, the only one with numerous such bacilli having come from a marsh frequented by lepers. He next examined leeches fed on infective lepers and found acid-fast bacilli in some of them up to the 22nd day, but in decreasing numbers. By the use of the centrifuge, however, they were detected in an apparently unchanged condition up to the 43rd day. Although he was not able to transmit the bacilli through leeches, as shown by negative results of microscopical examination of tissue bitten by infected leeches and immediately excised in more than 4.8 per cent. of the leeches, he thinks they may occasionally transmit the disease. L. R.

DE BALMANN (A.). Lèpre et prostitution à Tahiti et aux Iles sous le Vent. [**Leprosy and Prostitution in Tahiti and the Other Society Islands.**—*Marseille-Méd.* 1937. Feb. 15. Vol. 74. No. 5. pp. 185-191.

This is a brief description of the prevalence of leprosy, elephantiasis and venereal disease in these Oceanic Islands. One hundred and three lepers are isolated, but allowed to marry even healthy girls, but any children born are removed at once and brought up separately. L. R.

MARCHOUX (E.). La lutte contre la lèpre dans les colonies françaises. [**The Leprosy Campaign in the French Colonies.**—*Bull. Acad. Méd.* 1937. July 6. 101st Year. 3rd Ser. Vol. 118. No. 26. pp. 16-22.

The author first refers to the failure in the middle ages of the drastic segregation measures against leprosy, which were continued up to the time of the third International Leprosy Conference at Strasbourg in

1923, since which more enlightened measures have gradually been introduced by successive French surgeon-generals with the help of an advisory commission. The first step was to enumerate the number of lepers among the population as a preliminary to introducing sanitary measures for the control of the disease. Secondly, the hospital accommodation for infective cases was increased and dispensaries opened to allow of regular treatment being carried out, together with domiciliary visits when necessary to enable simple rules to be enforced to limit infections. These included separate beds and feeding utensils for the patients, and ensuring that they washed their own clothes without their being mixed with those of the healthy. Ulcers were regularly dressed to prevent infection being carried from them by flies. The most dangerous cases were provided for in hospitals, as in the case of tuberculous patients, and sanatoria for helpless cases. Treatment by hydnocarpus preparations made in Pondichéry was also provided.

In West Africa Dr. ROBINEAU has commenced an enumeration of the lepers, a centre has been established for study of the subject and special leper villages for each tribe provided. Already 40,000 cases are known, and many are being treated in dispensaries and colonies. In Madagascar much has for long been done for the lepers by missionary bodies, and agricultural colonies are being provided in Cochin China and elsewhere. Altogether much progress is being made regarding leprosy in the French Colonies. L. R.

LOWE (J.). **Leprosy and Anti-Leprosy Work in India.**—*League of Nations. Health Organisation. Intergovernmental Conference of Far-Eastern Countries on Rural Hygiene. Preparatory Papers relating to British India.* Ser. L.o.N.P. 1937. III. 6. pp. 103–114. With 1 map.

This is a general account of the campaign against leprosy in India by the Council of the British Empire Leprosy Relief Association and various missionary bodies with substantial subsidies by the Government. A table of the 1931 Census figures of the more advanced and easily recognized cases, with the rates per mille in different areas and a map of the distribution are recorded. The surveys and propaganda work are described and the following measures dealt with.

Numerous clinics have been established, mostly attached to hospitals and dispensaries without a special staff, which produce a certain amount of clinical improvement. Where a special staff is available much more valuable work is done, including domiciliary visits with advice on isolating infective cases in separate houses or rooms. About 10,000 patients are accommodated in various government and missionary institutions, with separation of the sexes and there are practically no children of leper parents. Healthy children of lepers are also brought up in separate institutions. In each province an attempt is being made to organize at least one well-equipped leper colony on a self-supporting basis as a centre of study. Very numerous medical men have been given a short course of instruction at the Calcutta School of Tropical Medicine, where a whole-time leprosy research worker and staff are maintained. Special attention is paid

to the protection of the children of lepers. The problem of leprosy in India is a vast one, but it is being tackled in a progressive spirit.

L. R.

BLACKLOCK (D. B.). Studies in Rural Hygiene in the Tropics. V.—The Prevention of Leprosy.—*Ann. Trop. Med. & Parasit.* 1937. July 13. Vol. 31. No. 2. pp. 293–298. With 2 figs. on 1 plate.

This brief paper records the impressions derived from a visit to the East, including the Penang and Kuala Lumpur leper settlements, where most of the patients are Chinese, who readily try new remedies. Calcutta and Ceylon were also visited. The author hopes that the crude incarceration of lepers with the aid of guards and barbed wire is dying out, and the colony system with land and employment taking its place, and he favours a voluntary system to attract the patients. He also stresses the importance of the provision of village sanitation and education.

L. R.

RODRIGUEZ (José). Significance of Cordova Leprosy Survey with Regard to the Policy of Compulsory Segregation in the Philippines.—*Monthly Bull. Bureau of Health.* Manila. 1937. Jan. Vol. 17. No. 1. pp. 18–28. With 1 folding fig.

This is an interesting attempt to estimate the effect of the Philippine segregation policy initiated in 1906 in the foundation of the Culion settlement, by examining the whole of the population in a limited area for the prevalence of leprosy in 1933 and 1935.

Altogether 194 positive cases were sent to Culion from Cordova in 1904–35, and the recent surveys of all but 24 of the 6,063 Cordova inhabitants revealed 105 living cases of leprosy, not including three hidden cases, 45 of whom were bacteriologically positive and 42 of these were isolated at Culion or at a local treatment station. The small number of unsegregated contagious cases was unexpectedly good. In addition 13 lepers had died in Cordova without being segregated owing to their hiding. It is pointed out that under the compulsory system most of the infective lepers are not discovered until long after they have reached that stage, but to prevent infections continuing to occur it is essential that they should be discovered and isolated within a few months at the most, which can only occur if the masses are willing and intelligent enough to co-operate with the health authorities in the hospitalization of cases in an early stage with good medical care and education.

A table shows that the numbers sent to Culion are too few and variable to allow of any conclusions regarding the effect of their isolation.

A chart is given of the presumed number of open and closed cases in Cordova from 1900 to 1935, which shows a gradual decrease of open cases, especially since 1924, the year in which the first paroled cases arrived from Culion, and a great increase in the open cases since 1924, with early cases coming forward voluntarily for treatment, so that the decisive period is considered to be from 1929 to 1935 with the new policy of releasing recovered cases under the improved treatment, and the opening of the Cebu Skin Dispensary for the local treatment of early voluntary cases. To date there is no definite tendency for the numbers segregated to diminish, but the open cases

have decreased, and they are becoming less advanced in nature on discovery, which is an encouraging sign, but the full effects of the modern policy will not be apparent until a decade has passed. Mass education is still needed, together with making the leper hospitals attractive to the people.

L. R.

MUIR (Ernest). **Leprosy in the Southern Sudan.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 107–110.

This short note deals with the control of leprosy in the Southern Sudan organized by Dr. ATKEY about a decade ago. He criticizes the optimistic attitude of WOODMAN regarding the results of treatment among 2,000 cases in the largest of the three leper settlements into which the scattered patients were collected—a unique measure necessitated by the peculiarly unfavourable conditions with 2·8 per cent. of infections over a large area. By 1932, 31 per cent. of the lepers had been rendered quiescent, and by 1935 the percentage had increased to 78, a large proportion having been early cases. A stage has now been reached where further treatment by chaulmoogra oil is ineffective. The 1935 report concludes “that (1) less than 10 per cent. of the cases are at present a danger to their neighbours as far as can be judged; (2) treatment is effective and worth trying in a large percentage of active early cases over a period not exceeding 4 years; and (3) the settlements have removed the chief foci of infection in the district, and both centralised and simplified their control.” The prospect is thus bright, with continued vigilance against invasion from the neighbouring highly infected Belgian Congo.

L. R.

MONTEL (M. L. R.) & BABLET (J.). **La lèpre tuberculoïde en Cochinchine.** [**Tuberculoid Leprosy in Cochinchina.**]—*Internat. Jl. Leprosy.* Manila. 1937. Apr.–June. Vol. 5. No. 2. pp. 135–150. With 7 figs. on 2 plates.

The author concludes from a study of the tuberculoid variety of leprosy in Cochinchina that this form is a cutaneous reaction to the lepra bacillus, and not a special form of the disease. His cases were mostly of the nerve type, but it is also not rare in cutaneous cases, and the lesions often present forms intermediate between the two main types of leprosy. There is thus no necessity to give it a special place in the classification of the disease. The term tuberculoid leprosy is therefore misleading and the author prefers the terms “lepride tuberculoïde marginée à extension centrifuge” or “tuberculoid de la lèpre.” It has a feeble evolution, is wanting in a tendency to become generalized, and is attributable to the resistance of the patient to an attenuated form of the causative germ, with the transformation of the lesions into the tubercular form.

L. R.

WADE (H. W.) & LOWE (John). **The Type-Distribution of Patients at the Purulia Leper Colony.**—*Leprosy in India.* 1937. Apr. Vol. 9. No. 2. pp. 39–48.

This detailed analysis of a series of cases examined during a brief visit to Purulia is summarized in the following table:—

	Calcutta	Purulia
Neural	81 cases (82 per cent.)	79 cases (52 per cent.)
Cutaneous	18 cases (18 per cent.)	74 cases (48 per cent.)
Total	99 cases	153 cases
Tuberculoid macules :		
Major	27 — four with ? cutaneous change	17 — four with ? cutaneous change
Intermediate	7 — one with nerve abscesses	
Minor	18 — one with ? cutaneous change	16
Simple or residual macules	20	9
Anesthesia of limbs, no macules	9 — one with nerve abscess	37 — eight with ? cutaneous change
Total	81 cases	79 cases

JOHANSEN (Frederick A.). **Similarities in the Manifestations of Leprosy and Tuberculosis.**—*Amer. Rev. Tuberculosis*. 1937. May. Vol. 35. No. 5. pp. 609-617. [21 refs.]

This note describes once more the well known affinities of these closely allied diseases. L. R.

DE SOUZA-ARAUJO (H. C.). *Dermatite verrucosa leprotica*. (Estudo de 3 casos.) [**Dermatitis Verrucosa in Leprosy.**]—*Mem. Inst. Oswaldo Cruz*. 1937. Vol. 32. No. 2. pp. 311-320. With 3 plates. [14 refs.] English summary.

The author gives note of three cases among leper patients at the Curupaity National Leprosarium, Rio de Janeiro. All were C3 type, with extensive leprous lesions, but on the foot and lower part of the leg a marked rugose condition of "verrucous dermatitis," bearing a fairly strong resemblance to mossy foot. Attempts to cultivate *Blastomycetes* (*Acrotheca* or *Hormodendrum pedrosoi*) were fruitless, but Hansen's bacilli were numerous and the histological changes those of leprotic granuloma. He believes that there is no blastomycotic element in it, but that the whole is due to leprosy *tout seul*—a new syndrome of the disease—and he suggests that those in charge of lepers should be on the look out for such cases in order that their pathogeny can be studied. H. H. S.

TOLENTINO (Jose G.). **Acute Generalized Exfoliative Dermatitis as a Manifestation of Lepra Reaction with Report of Two Cases.**—*Monthly Bull. Bureau of Health*. Manila. 1936. Sept. Vol. 16. No. 9. pp. 337-343. With 8 figs. on 2 plates.

FERNÁNDEZ (José M. M.). **El cuadro clínico de la reacción leprosa.**—*Semana Méd.* 1937. May 20. Vol. 44. No. 20. pp. 1392-1403. With 11 charts. [10 refs.]

SALLE (A. J.) & MOSER (J. R.). **Bacteriology of Leprosy. IV. Influence of Environment on the Phenomenon of Acid-Fastness.**—*Internat. Jl. Leprosy*. Manila. 1937. Apr.-June. Vol. 5. No. 2. pp. 163-174.

"1. Four nonacid-fast diphtheroids isolated from human nodules and rat granuloma are acid-fast in tissue culture and in minced embryo medium but not on the usual laboratory media.

"2. Minced liver, kidney and spleen of adult rabbits and guineapigs served as satisfactory substitutes for minced chick embryo medium for the production of acid-fast forms.

"3. The property of adult and embryonic tissues to induce the acid-fast stage of the diphtheroids is not destroyed by heating or removed by filtration. Therefore, neither living nor dead tissue is necessary for the production of acid-fast forms.

"4. Acid-fast forms can be produced in serum.

"5. The organisms are capable of assuming the acid-fast stage in a medium composed of beef heart and cholesterol.

"6. It is concluded that for the production of acid-fast forms from these organisms two factors are essential: (a) The medium must be of such composition as to foster the growth of the organisms to the stage at which they are capable of becoming acid-fast. (b) Cholesterol or some other substance must be supplied in the medium when this stage is reached.

"7. A change in the lipid metabolism of these organisms is believed to take place concurrently with the change in morphology as followed by microscopic observation.

"8. A group of microorganisms of the order Eubacteriales inoculated into minced tissue medium and also into 0.5 per cent. cholesterol beef heart medium did not show any acid-fast forms.

"9. The phenomenon of acid-fastness appears to be restricted to members of the order Actinomycetales." L. R.

LIMA (Moacyr de Souza). *Cultura do Mycobacterium leprae*. (Verificação dos Trabalhos de Vaudremer.) [Cultivation of *Mycobacterium leprae*. Repetition of Vaudremer's Work.]—*Rev. Brasileira Leprologia*. S. Paulo. 1937. June. Vol. 5. No. 2. pp. 133-140. With 6 figs. (2 coloured on 1 plate).

The author has repeated the work of VAUDREMER who isolated from lepers a fungus, actinomyces-like, with varying morphology and characteristics according to the medium employed. The author does not think that Vaudremer's organism is Hansen's bacillus because: (1) Cultural attempts fail in more than half the cases; (2) Direct inoculation from patient to laboratory animal (e.g., anterior chamber of the eye of a rabbit) never shows organisms differing in morphology; (3) In attempted cultures the Hansen's bacilli persist and later disappear, but never present differences in morphology or staining characters, nor do they in sections of leprous tissue. Those who maintain that the organism of leprosy is at one stage acid-fast, and not at another, must prove their point and until they do the safer attitude to assume is that when non acid-fast organisms are found in the culture tubes of Hansen's bacillus these are not *Myco. leprae*.

H. H. S.

SARDJITO & MOCHTAR (A.). Een poging tot het cultiveeren van lepra-bacillen. [An Attempt at the Cultivation of Leprosy Bacilli.] —*Geneesk. Tijdschr. v. Nederl.-Indië* 1937. Aug. 24. Vol. 77. No. 34. pp. 1995–2065. With 6 figs. on 3 plates. [48 refs.] English summary.

A case of typical leprosy with anaesthetic maculae, thickened nerves, claw hand and acid-fast bacilli in the nasal secretion was admitted to hospital. He received intramuscular injections of chaulmoogra oil and iodized chaulmoogra ethyl ester intramuscularly in the buttock; an abscess developed in this region. The pus contained acid-fast bacilli and a luxuriant eugonic culture was obtained of these in 14 days time. It is the aim of the authors in this very detailed communication to contend for the recognition of this culture as a true leprosy culture and for the subsequent finding of quite typical tubercle bacilli in urine and lung material at a later date as due to secondary infection of a leper with tuberculosis.

After development of the abscess, radiographs were taken which showed some indication of possible tuberculous disease of the sacro-iliac joint or its vicinity. By this time also there were indications of tuberculosis of the lungs, and acid-fast bacilli were found in the sputum. Later developments were adenitis and haematuria. There were acid-fast bacilli present in the urinary sediment. On inoculation of guinea-pigs with this sediment and with sputum, acid-fast bacilli were found at the inoculation site. Death of the patient took place about 19 months after admission to hospital and a full autopsy was obtained. Some of the findings were:—

Enlargement of bronchial glands: a small cavity in the left upper lobe of the lung and tubercle follicles. The left kidney was shrunken, and tuberculous lesions, both macroscopic and microscopic, were found. Numerous tubercle follicles were present in the liver. No lepromata were found in any of these organs.

The bacteriological investigations in this case are most important and included extensive cultural and animal tests. Pus from the buttock abscess was inoculated into various media (Lubenau, Souton and Kirchner) and gave a luxuriant culture on Lubenau medium, which in 14 days had the appearance corresponding to a tubercle culture of 1½ to 2 months. This was itself very remarkable, as also was the fact that the films made from the culture were fine and easily spread, like those of avian tubercle. Many tests were done on animals—guinea-pigs, monkeys, rabbits, white mice, rats and fowls. The deduction made from these is that it was highly improbable that the bacilli from the buttock abscess could possibly have been tubercle bacilli, either of mammalian or avian type. Microscopically these bacilli were both acid-fast and alcohol-fast. Conclusions are as follows:—

(1) The patient suffered from leprosy which became complicated later with renal and pulmonary tuberculosis. (2) The results of autopsy showed macroscopic and microscopic evidence of tuberculosis of kidney, liver and lung. (3) The guinea-pig inoculated with lung material from the patient, was infected with tubercle. (4) Before the patient came to suffer from the tuberculous complication an acid-fast bacillus had been isolated in culture from an abscess in the buttock. (5) This culture was not pathogenic for the guinea-pig, rabbit, the white rat, fowl and grey monkey (*Macacus cynomolgus*), so that it is wholly improbable that it could have been tubercle; nor was it a saprophytic bacillus. (6) These acid-fast

bacilli, which were non-pathogenic for the guineapig, were virulent for the black monkey (*Simmopithecus maurus*) and for a white mouse. (7) The bouillon culture filtrate acted more energetically by intracutaneous injection in lepers than the leprosy antigen of Matsuda. (8) Cross complement fixation reactions appeared to show that the culture from the buttock abscess was more closely related to leprosy bacilli than to tubercle bacilli whether of human, bovine or avian type or than to saprophytic, chromogenic acid-fast bacilli. It is very probable therefore that this culture, non-pathogenic for the guineapig, is a leprosy bacillus culture. (9) Complement fixation tests with rabbit immune sera indicate its closer relationship to the leprosy bacillus than that of the tubercle bacillus to the latter. (10) With human leprosy sera, however, no antigenic distinction could be made out between the abscess strain and tubercle bacilli. (11) There have thus been obtained two strains of acid-fast bacilli from the same patient, the one *Mycobacterium leprae*, the other *Mycobacterium tuberculosis*. W. F. Harvey.

LEGENDRE (F.). Note sur la recherche des bacilles de Hansen dans les gouttes épaisses. [**Search for Leprosy Bacilli in Thick Drops.**]—*Bull. Soc. Path. Exot.* 1937. July 7. Vol. 30. No. 7. pp. 547–549.

The author has sought to verify the statement of SARDJITO and SITANALA that lepra bacilli are readily found in thick drops of blood taken from apparently healthy skin. In suspected cases of the disease examined by various methods, 30 out of 107 proved positive on examination of nasal mucus and a drop from a leproma, but the finger blood was negative. Among 237 interned lepers similarly examined 87 were positive on examination of nasal mucus and a drop from a leproma, but again the finger blood was negative. L. R.

WATANABE (Yoshimasa). **Experimental Studies on Animals concerning Leprosy. Report VIII. On the Influence of Inoculation with Heated Emulsion of Rat Lepra Tissue on the Growth of Rat Leprosy.**—*Kitasato Arch. Experim. Med.* 1937. May. Vol. 14. No. 2. pp. 125–141. With 4 coloured figs. on 1 plate.

In this interesting communication the author records experiments to show that if normal rats are repeatedly inoculated with emulsions of rat leprosy bacilli in white lepra granulomatous tissues, killed by heating to 70°C., the injected rats develop a certain degree of resistance to subsequent inoculations of fresh rat tissue emulsion, as shown by a large proportion of mild infections ensuing. On the other hand, injection of rats with heated human leprosy emulsions did not confer any such protection against subsequent rat leprosy infection.

L. R.

TERADA (M.) & NOZAKI (Minoru). **Studies concerning Human and Rat Lepra Bacilli and the Other Acid Fast Organisms. Part II. Biological Studies on the So-called Nonpathogenic Acid Fast Bacteria.**—*Kitasato Arch. Experim. Med.* 1937. May. Vol. 14. No. 2. pp. 142–164. [14 refs.]

“Biological studies of fifty strains of human and rat lepra bacilli and acid fast bacteria found in nature showed the following results.

“1. The so-called nonpathogenic acid fast bacteria have the catalase action.

"2. The so-called nonpathogenic acid fast bacteria have no oxydase action.

"3. The so-called nonpathogenic acid fast bacteria have no gelatinase action.

"4. The so-called nonpathogenic acid fast bacteria have no casenase action.

"5. The so-called nonpathogenic acid fast bacteria have lipase action.

"6. The so-called nonpathogenic acid fast bacteria have no amylase action.

"7. The so-called nonpathogenic acid fast bacteria ferment monosaccharides such as glucose, laevulose and galactose.

"8. The fermentative action of all the fifty strains of the so-called nonpathogenic acid fast bacteria have the same attitude, though there is difference in the strength in different strains."

L.R.

MANALANG (J.). **The Morphology of *My. leprae* during the Course of Treatment.**—*Monthly Bull. Bureau of Health*. Manila. 1937. Jan. Vol. 17. No. 1. pp. 3-10. [10 refs.]

——. **The Morphology of *My. leprae* before Treatment in Readmitted Relapsed Cases.**—*Ibid.* pp. 11-17.

The first of these notes records the findings in the examination of 124 patients during the course of intensive chaulmoogra treatment that resulted in their being paroled as negative cases. After an average period of nearly six months such treatment originally solid bacilli had usually become segmented, and originally segmented ones had become granular, while of originally granular forms none had become solid, and three-fourths remained granular; so the morphological behaviour under treatment was for the solid forms to become segmented or granular, the latter being possibly degenerated forms before they disappeared. The changes may, however, not be the effects of treatment, but rather natural processes in the developmental cycle of the causative organism.

The second note deals similarly with 52 readmitted relapsed patients in whom no relation of morphology to clinical type of lesion, course or stage of the disease was found, so he thinks it possible that segmentation and granulation are not degenerative processes.

L. R.

MANALANG (J.). **Removal of Acid-Fastness from "*My. leprae*."**—*Monthly Bull. Bureau of Health*. Manila. 1937. Feb. Vol. 17. No. 2. pp. 47-54.

This is a report on the application of work on the tubercle bacillus to that of leprosy. Portions of inguinal lymphatic glands taken three hours after death were used for the supply of lepra bacilli. They were cut into small pieces, dehydrated for one minute with 95 per cent. ethyl alcohol; incubated at 37°C., and stained before and after with carbol fuchsin. After one week a certain amount of loss of acid-fastness was found, and this increased gradually to become almost complete at the end of four months. Similar experiments with iodized Wightiana ethyl esters and Wightiana oils produced similar results. Globus formation was lost early, and after the bacilli had become non acid-fast and stained blue with Loeffler's solution, and later showed signs of disintegration. He therefore suggests a trial of oleic acid in the treatment of leprosy. [L. Rogers reported some benefit from the use of soaps made from olive oil nearly two decades ago.]

L. R.

BIER (Otto) & PLANET (Nelson). Ueber die Serologie der Lepra. VI. Anwendung der Witebskyschen Methode zur Herstellung eines Antigens für Komplementbindung bei Lepra mit "Streptothrix leproides." [The Serology of Leprosy. VI. Use of Antigen Prepared by Witebsky's Method.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Aug. Vol. 41. No. 8. pp. 565-567.

This brief note reports that the chemical fractionation of the streptothrix leproides (Deicke) by the method of Witebsky furnishes a complement binding active fraction, which resembles the specific lipid contained in the tubercle bacillus. The sensitiveness and specific nature of the antigen obtained by this method runs parallel with that of tubercle antigens, although that with leprosy serum is not so intense.

L. R.

DES ESSARTS (J. Quérangal) & LEFROU (G.). Histopathologie de la lèpre cutanée. Les lésions des glandes sudoripares. [Histopathology of Cutaneous Leprosy. Changes in the Sweat Glands.]—*Bull. Soc. Path. Exot.* 1937. July 7. Vol. 30. No. 7. pp. 543-547. With 2 figs.

The authors point out that in about half the cutaneous lesions of nerve leprosy the causative organisms cannot be demonstrated in the lesions, but histological examinations reveal changes of diagnostic value. They describe the changes in the sweat glands more particularly on the lines shown by DARIER, and lay stress on granuloma-like changes in these glands, with later considerable degree of atrophy, and point out that these changes account for the loss of sweating of the affected skin in leprosy.

L. R.

EMERSON (George A.). Influence of Dehydrocholic Acid (Decholin, N.N.R.) on Oral Toxicity of Chaulmoogra Oil.—*Internat. Jl. Leprosy.* Manila. 1937. Apr.-June. Vol. 5. No. 2. pp. 159-162. With 1 fig.

Owing to the emetic action of this oil its oral toxicity can only be tested on animals that do not vomit, such as rats, which were used in the experiments reported in this paper. In one series dehydrocholic acid (decholin N.N.R.) was added to increase the absorption of the oil from the gastro-intestinal canal, which was found considerably to increase the toxicity of the drug. It was found that while 2 cc. per kilo. of the oil alone may kill some rats, it is difficult to give enough to kill them all. On the other hand, with the addition mentioned, 20 cc. per kilo. always proved fatal. He concludes that the oil is far less toxic orally than its water-soluble derivatives.

L. R.

SOREL. Traitement de la lèpre par injections intraveineuses d'huile de chaulmoogra neutralisée. [Treatment by Neutralized Chaulmoogra Oil Intravenously.]—*Bull. Acad. Méd.* 1937. May 4. 101st Year. 3rd Ser. Vol. 117. No. 17. pp. 489-492.

The author reports on the intravenous use in French colonies of neutralized chaulmoogra oil introduced by Colonel Labernadie, of which 14,622 injections have been given without any accidents, although slight cough may ensue if not fully neutralized. It is made from *Hydnocarpus wightiana* oil extracted from fresh seeds with an acidity not exceeding 3 per cent., and is well tolerated without producing any kind of reaction. Doses of 1 to 2 cc. twice a week are given

and the immediate results are very evident with improvement after a dozen injections, with softening and reduction of nodules and of a leonine appearance. Plantar ulcers heal and the lepra bacilli disappear from the nasal mucus, with arrest of the evolution of the disease and diminished infectiveness. The ultimate results are less precise on account of the variable course of the disease. The total dose varied between 140 and 160 cc. given in courses of 16 to 24 injections, after which progress seems to be arrested. The harmlessness and utility of the treatment makes it advisable to make it known. L. R.

ROSE (F. G.). **A New Hydnocarpus Preparation.**—*Internat. Jl. Leprosy.* Manila. 1937. Apr.–June. Vol. 5. No. 2. pp. 179–180.

Yet another modification is a hydnocarpus preparation called "Hoechst 4828a" which has been used by this writer intradermically, with complete subsidence of the dermal lesions in eight months in six cases, marked, though not complete, recovery in eight, slight subsidence in seven, in three the nodules were subsequently excised, one was lost sight of and in the remaining two little change was noted. The injections were painless and were used chiefly in face lesions, and the preparation is said to have caused the subsidence of cutaneous nodules and thickened areas of limited extent more rapidly than others he has used. L. R.

LOWE (J.) & DE (N. K.). **Tests of the Suitability of Hydnocarpus Oil for Injection.**—*Leprosy in India.* 1937. Apr. Vol. 9. No. 2. pp. 49–53.

This note has been written to answer many questions asking for information on the subject. The oil should be made from fresh ripe seeds, preferably with the outside removed to avoid particles of dust, etc., or filtered to get rid of them. It should be got from a reliable dealer to avoid the common adulteration. A good hydnocarpus oil should have a specific rotation of about $+57^\circ$, and oils with readings below $+53^\circ$ are probably adulterated. To prevent oxidation it should be free from dust, etc., and protected from air, sun, light and heat, and be perfectly free from water. Tests for oxidation, acidity and the presence of peroxides are also given. L. R.

FLANDIN (Ch.) & RAGU (Jean). Mal perforant plantaire guéri en deux mois par les injections intraveineuses du complexe chaulmoogra-cholestérol chez une lépreuse traitée depuis dix ans par les thérapeutiques classiques.—*Bull. et. Mém. Soc. Méd. Hôpit. de Paris.* 1937. May 31. 53rd Year. 3rd Ser. No. 18. pp. 734–737.

- i. TISSEUIL (J.). Traitement de la lèpre tuberculoïde par les injections intra-dermiques d'éther éthylique de gorli (*Caloncoba glauca*). (Première note.) [Treatment by Gorli Esters.]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 356–359.
- ii. —. Les injections d'éther éthylique, d'huile de chaulmoogra, intra-musculaires, et l'ingestion de savon de gorli (*Oncoba echinata*) ont-elles une action préventive dans la lèpre. [Treatment by Gorli Esters as Preventative.]—*Ibid.* July 7. Vol. 30. No. 7. pp. 549–551.

i. In this note the author reports favourable results from the intra-dermic injections of 2 cc. doses twice weekly of esters made from gorli seed of West Africa, which contain chaulmoogric acid.

ii. This note records the use of weekly intramuscular injections of 2 cc. doses of gorli esters for over a year, followed by oral doses of 5 to 15 cc. of gorli soap in a 1 per cent. solution weekly, in 30 children aged 2 to 12 years, who were living with leper parents, as a prophylactic measure. Ten, or 33 per cent. of the children, developed leprosy symptoms in spite of this preventative treatment. L. R.

LEPROSY REVIEW. 1937. July. Vol. 8. No. 3. pp. 101-150.
With 15 figs. on 4 plates. Quarterly Publication of the British
Empire Leprosy Relief Association, 131 Baker Street, London,
W.1. [1s. 6d.]

In this note three nodular cases of leprosy with great improvement, as shown by photos before and after treatment, after intramuscular injections of esters in the form of moogrol are recorded from Southern Rhodesia. L. R.

TOLENTINO (Jose G.). **Further Studies on Factors supposed to Influence the Result of Treatment of Leprosy.**—*Monthly Bull. Bureau of Health.* Manila. 1937. Feb. Vol. 17. No. 2. pp. 55-61.

The author finds amenability to treatment to be in inverse ratio to the number and density of the lesions, as might be expected. Lesions with well defined borders, and those with a high degree of hyperaemia, are also more favourable than the reverse conditions. He also agrees with other workers in the importance of regular treatment, for unless a patient receives at least 80 per cent. of his weekly injections he does not get full benefit. At least 3 and not more than 5 cc. doses, with a total amount of 75 to 125 cc., are advised. L. R.

COCHRANE (R. G.) & RAJ (M. Paul). **Solganal-B Oleosum in the Treatment of Leprosy.**—*Leprosy in India.* 1937. July. Vol. 9. No. 3. pp. 75-80.

This is a brief report on treatment of eight cases of leprosy with weekly intragluteal injections of Solganal-B in oil in doses of 0.05 to 0.2 gm. of this gold preparation. The results were not striking, but in five there was a tendency to subsidence of a lepra reaction. Larger doses tended to produce reaction and the drug was less efficient in their control than tartar emetic and fluorescein. Courses should not be repeated at shorter intervals than three months. L. R.

SARKAR (Sarasi Lal) & BHATTACHARYA (Beni Madhab). **The Effects of the Injections of Milk Preparations in Leprosy.**—*Indian Med. Gaz.* 1937. July. Vol. 72. No. 7. pp. 398-401.

The authors have used coccal vaccines, and 2 to 10 cc. doses of lactoprotein prepared in Bengal, in a few cases of leprosy, and they consider them to be of value in relieving rheumatic pains in the joints and limbs, but not true nerve pains. L. R.

TRYPANOSOMIASIS.

RHODESIA, SOUTHERN. Report on the Southern Rhodesia Trypanosomiasis Committee and Bureau [BRAIN (Chas K.), Vice-Chairman]. —22 mimeographed pp. With 1 folding map. 1937. Jan 9.

The Report commences with a brief history of trypanosomiasis in Southern Rhodesia. Until 1909, the only form of trypanosomiasis encountered in Southern Rhodesia was the disease of domestic stock, but in that year a European arrived from Northern Rhodesia suffering from sleeping sickness. In 1912, an official of Southern Rhodesia, who had never left the country, contracted the disease, and investigation in the Sebungwe during the year revealed 11 infected natives. During the past 25 years 7 European cases and 54 native cases have been discovered; of these, 10 (2 Europeans and 8 natives) have occurred during the past 4 years. As the result of the scientific and practical interest of the Prime Minister (the Hon. G. M. Huggins, F.R.C.S.) in the matter, and of his appreciation of the necessity for co-operation in research between the members of the various sciences involved, the Trypanosomiasis Committee and Bureau was constituted on as wide a scientific basis as possible.

The Bureau was set up for the collection, collation and distribution of information concerning the trypanosomiasis of man and animals in Southern Rhodesia and other parts of the world. Between 300 and 400 workers in trypanosomiasis were circularized by the Hon. Secretary, Mr. L. E. W. Bevan, asking for information, literature and advice; the response was very satisfactory.

Shortly after the creation of the Committee a request was received from Government to consider and report upon the existing policy of game destruction for the control of tsetse fly. This policy, which had been in operation since 1922, involved considerable expense and the destruction of large numbers of game, and had met with much criticism. After consideration of the evidence placed before it, and after the most careful deliberation, the Committee submitted a report which is set forth in detail and must be read in the original by those interested. The general conclusion reached is that the present system of organized and carefully controlled slaughter of game, when necessary, together with adequate fencing and necessary control of traffic, should continue until an effective alternative is forthcoming. The Committee is of opinion, however, that in view of a condition of approximate equilibrium having been established, the next step is emphatically the provision of funds for the continuance of research into this important problem.

A scheme of tsetse fly research submitted by the Chief Entomologist was considered, but the Committee did not feel justified in giving the scheme its unqualified report.

The Committee also considered a scheme for co-operation in research between the territories of Southern and Northern Rhodesia and Nyasaland, and made various recommendations in favour of such a scheme; these are given in detail.

The document ends with a progress report on research in trypanosomiasis by Bevan. This is as follows:—

"1. Attempts have been made to identify the common trypanosomes of man and animals in Southern Rhodesia.

" 2. *T. congolense*. From its response to certain drugs it would appear that the so-called *T. congolense* of animals in Southern Rhodesia differs from that species in other countries. Recent observations confirm the views expressed in 1909 when it was decided to refer to it as *T. pecorum*.

" 3. *T. rhodesiense*. The incidence of endemic foci of human trypanosomiasis suggests that the causal parasite is distinct from the so-called *T. brucei* of animals in other parts of the country.

" 4. The infection would appear to be transmitted man-fly-man, rather than animal-fly-man.

" 5. It would appear that in endemic areas man may become 'tolerant' or 'preimmune.'

" 6. Experiments with rats and mice indicate that young animals are susceptible to infection, but if well nourished and not unduly disturbed may recover, even from a most virulent strain of trypanosome.

" 7. If re-infected during the course of the original infection they may become 'tolerant.' The maintenance of tolerance is dependent upon the persistence of infection. Tolerance of man to the human trypanosome, as far as this country is concerned, has only been possible in the so-called 'Survival areas' of the fly, as defined in the Entomologist's maps.

" 8. The same principle probably applies to the tolerance of the wild animals in 'fly' areas.

" 9. A 'tolerance' against *T. pecorum* can be set up by antimony treatment.

" 10. To set up 'tolerance' the animal must not be sterilised of the parasite.

" 11. If so sterilised it again becomes susceptible to re-infection.

" 12. If rendered 'tolerant,' its 'tolerance' must be maintained by fly or syringe re-infection.

" 13. 'Tolerance' has its disadvantages in that a tolerant animal is a 'carrier' and may be a source of infection to susceptible animals. Also 'tolerance' breaks down when the animal is subjected to adverse conditions.

" 14. Nutritional deficiencies predispose to break down of 'tolerance.' A general revolution of the method of animal husbandry in 'fly' areas is necessary if 'tolerance' is to be successful.

" 15. To obviate these disadvantages, a firm sterile immunity (as in bacterial and virus diseases) rather than a 'tolerance' is desirable. Experimental work in this direction is in hand.

" 16. In maintaining Tsetse flies under laboratory conditions, it has been found possible to keep them alive for three months by feeding them on rabbits. Such laboratory-bred flies have brought forth healthy pupae from which healthy flies have emerged. This disposes of the theory that certain large animals are necessary for the successful development and propagation of the 'fly.'

" 17. Some thirty specimens of soil have been collected from Tsetse-infested areas and have been analysed by the Chief Chemist as to their chemical and mechanical composition.

" 18. The successful propagation of flies up to the second generation in feeding-boxes and glass tubes, disposes of Henkel's theory of osmosis.

" 19. Recent observations have revealed a bacterial flora in field-collected Tsetse and pupae [and ?] in laboratory-bred Tsetse and pupae.

" 20. The rôle of these bacteria has not yet been determined. They, or some substance generated by them, may (a) aid the digestion of blood in the fly, (b) inhibit or encourage the development of trypanosomes in the fly, (c) inhibit or assist the development of trypanosomes in the animal [on ?] which the fly feeds.

" 21. *Chemotherapy*. A number of drugs supplied by Messrs. Bayer and other firms have been tested as to their curative and preventive effects against various species of trypanosomes. The results in small animals have been disappointing. The so-called 'Surfen C,' much vaunted as a remedy for *T. congolense* infection elsewhere, has not proved

as successful against the local strain of trypanosomes. It may be that we are dealing with a different species, an explanation which is supported by the fact that the local parasite responds more readily to Bayer 205 than to 'Surfen C.'

"Recent organic preparations of Arsenic have been found to exert an immediate curative effect but frequently untoward after effects occur which render the drugs too dangerous to be applied in practice.

"Much further research is necessary to determine how these arsenic and antimony-free organic preparations exert their trypanocidal effects. While preliminary tests upon small animals against local strains of trypanosomes are desirable, the final test must be carried out on larger domestic stock under natural conditions."

W. Yorke.

AFRIQUE EQUATORIALE FRANÇAISE. RAPPORT SUR LE FONCTIONNEMENT DE L'INSTITUT PASTEUR DE BRAZZAVILLE PENDANT L'ANNÉE 1936 [SALEUN (G.), Médecin Directeur]. Chapitre VI. pp. 73-85.—Service de la surveillance de la maladie du sommeil. [Survey of Human Trypanosomiasis in Brazzaville during 1936.]

During the year 1936, 702 Europeans were examined and 3 of them were found to have trypanosomiasis; details of each case are given. The number of natives examined was 29,197, and of these 239 had sleeping sickness. In addition, 1,735 old cases (including 4 Europeans) were kept under review. Of the 239 new cases, 9 died during the year, and of the 1,731 old cases 27 died; none of the European cases was fatal.

As in previous years the Couloir region provided the greatest number of cases in the Brazzaville sub-division. As a general rule, two visits are made to each place annually, but there is much in favour of 3-monthly visits. The chief reason for this is the fact that in the latest visits many of the cases discovered have been in an advanced nervous stage of the disease; more frequent inspection would allow of the discovery of cases earlier in the disease. The number of cures obtained with early cases is very high; the figure decreases considerably (probably by more than half) for those in the nervous stage of the disease. Even cases which are not definitely sterilized improve greatly, and it is interesting to inquire what happens to them. In a large proportion a relapse occurs and trypanosomes reappear either in the blood or in the spinal fluid; certain of these cases after a time become resistant to arsenicals. This new character of arsenic-resistance appears to survive cyclical passage through *Glossina*, so that one can observe more and more frequently failures after a first well-conducted medication. Such cases are not rare amongst natives, and are found also among Europeans, one case being found in 1935 and another in 1936. The best trypanocidal products are still the arsenicals, but in the resistant cases, when the parasite can be found in the circulation, the condition can be treated with moranyl; this drug is, however, not much use in the nervous stage of the disease. In the absence of a means of recognizing a definite cure, the only possibility is re-examination of the patient after a greater or less interval. The patients, however, whose general condition has greatly improved as the result of the treatment, are anxious to return to their homes in the bush, which are infested by tsetse. There is thus a great danger that those who relapse will disseminate a particularly dangerous virus, because the parasites they harbour will be resistant to arsenic. The patients are expected to return for re-examination a short period

after treatment, but many of them fail to do so. For the discovery of cases in an early stage of the disease, and for the control of old cases, the solution is the same, *viz.*, more frequent tours of inspection.

After discussing the relative value of the various methods of diagnosis, the report passes to the subject of syphilis in those infected with trypanosomes. The association of syphilis with trypanosomiasis is common and the diseases develop in the same way. This gives rise to an important question in treatment. The pentavalent arsenicals most employed in trypanosomiasis are inefficacious or even hurtful in syphilis; the trivalent arsenicals employed in syphilis (neosalvarsan, acetylarsan and stovarsol) do not act on the trypanosome. [This statement requires modification: acetylarsan and stovarsol are pentavalent arsenicals and neosalvarsan has a powerful action in trypanosomiasis.] The author considers that the administration of these [so-called] trivalent arsenicals to patients who are infected with trypanosomes is very liable to be followed by arsenic-resistance. In patients suffering from the two diseases, mercury and bismuth are given concurrently with the arsenicals usually employed for trypanosomiasis.

W. Y.

DUPUY. Etat de la maladie du sommeil en 1935, dans les régions du Bas-Congo et du Kwango, occupées par le Foreami. [*State of Sleeping Sickness in 1935, in the Regions of Bas-Congo and Kwango occupied by the F.O.R.E.A.M.I.*]—*Ann. Soc. Belge de Méd. Trop.* 1937. June 30. Vol. 17. No. 2. pp. 177-217.

The paper commences with a description of the methods of examination of the population adopted in various circumstances. The author then passes to the subject of arsenic-resistance. The physician can envisage arsenic-resistance only from the clinical and practical points of view. The terminology employed, *viz.*, primitive arsenic-resistance, secondary, precocious, later, and latent arsenic-resistance, may perhaps give rise to confusion. It would, of course, be erroneous to consider that every patient who is not cured by arsenical treatment, harbours an arsenic-resistant parasite; but it is permissible to call the patient arsenic-resistant when, notwithstanding prolonged and intensive treatment with trypanarsyl, parasites persist in the circulation. In the cases here cited the term arsenic-resistant is used in this sense, but it must be noted that all the cases were found in places where the existence of an arsenic-resistant virus has been long known and where it has been actually proved to be so by laboratory investigations.

Observations made in the course of the year 1935 on the question of the evolution of arsenic-resistance show a marked regression in the foci previously identified. In Mayumbe there was no case of primitive arsenic-resistance, 6 cases of secondary arsenic-resistance, and 2 of later or latent arsenic-resistance. In Cataractes-Nord no case was found; and in Cataractes-Sud no case of primitive or secondary arsenic-resistance, but 6 latent cases. No case was found in Lufimi-Basse-Sele. In Bas-Congo 6 primary cases were found at Lua-la, and 16 new cases of arsenic-resistance were discovered at Shinkakasa. In Kwango one secondary case was found at Bas Kwilu, and 8 secondary cases at Moyen-Wamba.

The author concludes that the problem of arsenic-resistance remains complex. There appear to be two causes which determine the

appearance of foci of arsenic-resistance. The first is insufficient treatment and deficient control; this leads to early acquired arsenic-resistance of the virus, which reveals itself by a transmissibility in general rather high at first, but which becomes less later. The second occurs in zones where patients have been well-treated; amongst the patients there are some who harbour trypanosomes which have become progressively resistant to the best conducted treatments; clinically these cases reveal themselves by a late appearance of trypanosomes in the circulation. This secondary late arsenic-resistance is recognized clinically by a high mortality and epidemiologically by a feeble transmissibility.

After some remarks on the nature of the treatment given, the author passes to a general review of the position as regards sleeping sickness in the year in question. The number of people examined was 1,001,900; and 4,259 new cases of the disease were discovered and the number of old cases observed was 10,570. Information is also given of the number of cases treated and of the general results. The various districts are then dealt with in detail.

W. Y.

CORSON (J. F.). **Further Observations on a Strain of *Trypanosoma gambiense*.**—*Ann. Trop. Med. & Parasit.* 1937. July 13. Vol. 31. No. 2. pp. 275–283.

In a previous paper the author concluded that a strain of *T. gambiense*, after repeated passages through monkeys and *G. morsitans*, showed no increase in virulence for the animals on which it was tested (this *Bulletin*, 1937, Vol. 34, p. 560). The present paper gives further observations on the same strain made during the following 8 months.

Corson comments on the results obtained by him in the following words:—

“Some further observations on a strain of *T. gambiense* were made, in order to see whether the strain would acquire increased general virulence and come to resemble *T. rhodesiense*. Three guinea-pigs which showed unusual susceptibility to the infection were selected from among the animals, which were inoculated from monkeys, and further inoculations into monkeys, guinea-pigs and rats were made from these guinea-pigs.

“In monkeys the infection never showed any similarity to infections with *T. rhodesiense*, and the same is true for most of the guinea-pigs and rats; but in guinea-pig 362 and rat 1907 there was some similarity. In guinea-pig 362 the infection developed more slowly than is usually seen in infections with *T. rhodesiense*, but in the later months the numbers of trypanosomes and the presence of posterior-nuclear forms gave an appearance in thin films that was indistinguishable from that of an infection with *T. rhodesiense*. In rat 1907 the infection was as acute as an infection with *T. rhodesiense*, but the continued absence of posterior-nuclear forms is at least rare in the latter infection when trypanosomes are numerous. In neither case, however, was the increase in virulence passed on to monkeys or rats, as would occur, so far as is known, with *T. rhodesiense*; and it cannot therefore be thought that a general increase in virulence had developed.

“There has been an opportunity of comparing this strain with a not very virulent strain of *T. rhodesiense* that has been maintained in sheep for over two years by transmission by *G. morsitans*. About 100 rats have been inoculated with this strain from sheep and other animals and from man, and about 50 rats have been infected by the bites of single isolated flies. The infections in the rats have been usually acute, and some shift of the nucleus forwards or backwards with fairly numerous posterior-nuclear forms was present in nearly all cases. In one or two instances great

resistance to the infection was shown, the rat living for about three or more times as long as the average duration ; but when its blood was inoculated into other rats they got the ordinary acute infection, showing apparently that the strain of trypanosomes had undergone no real or stable change in virulence for rats. This may be similar to the human case reported by Lamborn and Howat (1936).

" It is difficult to draw conclusions from these observations on one strain of *T. gambiense*, but the impression is given that, whatever may be the relationship between *T. gambiense* and *T. rhodesiense*, a typical strain of either does not easily change so as to resemble the other. It may be that different strains of one species (using the word species for convenience) also retain their mild or virulent character firmly, but there are instances of mild strains of *T. brucei* developing increased general virulence and retaining it.

" The history of trypanosomiasis in East Africa, though lacking detail, also suggests that the three species of polymorphic trypanosomes do not, at least easily, change so as to resemble one another. In Uganda all the strains of *T. gambiense* recorded in the early reports of the Sleeping Sickness Commission of the Royal Society in the years 1903, 1904 and 1905 showed little virulence for laboratory and domestic animals, yet *T. brucei* seems to have been present at this time. The ' Jinja trypanosome ' found in cattle in 1903 and in 1909 was regarded as *T. brucei*, and the trypanosomes from wild flies used in an experiment with the serum of reedbuck 2359 by Duke (1913) killed white rats in 21, 23 and 25 days, while another strain from wild flies killed a rat in 54 days. In German East Africa also (except on the Rovuma River) there is no record of any human infections resembling *T. rhodesiense* in their pathogenicity to animals, though it seems to be practically certain that *T. brucei* was also present. The three Tanganyika strains of *T. gambiense* sent by Kleine in 1912 to Bruce in Nyasaland showed very low virulence for monkeys, guinea-pigs and rats, though more for dogs, while the cases of sleeping sickness in Nyasaland at that time seem to have been all infections with *T. rhodesiense*, resembling closely, in man and experimental animals, the cases described by Kinghorn and Yorke (1913) in Northern Rhodesia and those occurring at present in Tanganyika Territory. In Zululand *T. brucei* has existed for many years, but no case of human trypanosomiasis has hitherto been found there. It is difficult to explain the occurrence, found since the Great War, of cases of sleeping sickness on the West Coast of Africa infected with trypanosomes indistinguishable from *T. rhodesiense*. Lester (1933) regards them as modifications of *T. gambiense* and considers that the two human trypanosomes are identical. There also chronic human trypanosomiasis and nagana due to *T. brucei* have existed together for many years.

" There are good reasons, apparently, for regarding the three polymorphic trypanosomes as forming one species for purposes of classification ; but it is not yet known whether any of them can change into either of the other two, a question that has been very much discussed during the last 25 years.

" The best way of attacking these problems seems to be by laboratory experiments."

W. Y.

LOURIE (E. M.) & O'CONNOR (R. J.). *A Study of Trypanosoma rhodesiense Relapse Strains in vitro.*—*Ann. Trop. Med. & Parasit.* 1937. July 13. Vol. 31. No. 2. pp. 319-340. [22 refs.]

The authors give the following lengthy summary of their work :—

" A. It is well known that the trypanosomes of a relapse differ immunologically from those of the initial stages of an infection, and that the differences are most conveniently studied in strains which produce a rapidly fatal infection in mice. It has been held that, in these hosts, the steady

multiplication of parasites, being opposed by no appreciable resistance, ensures that the immunological type of a strain remains unaltered for an indefinite number of passages. Working with a strain of *T. rhodesiense* which has been maintained continuously in mice for the past 14 years, we have found, however, that very rarely a mouse is actually capable of offering an appreciable resistance against infection, so that the incubation period is 7 days or more instead of being 5 days or less, as is normally the case even in infections produced by one single trypanosome. During the past 8 years, among 5,000 infections there have been only 5 with such prolonged incubation periods; in 2 of these the trypanosomes were studied and found to differ from the parent stem in the same way as is characteristic of relapse strains. It would appear, therefore, that 1 mouse in about 1,000 is able spontaneously to offer a resistance against the inoculated parasites, and that, as in the case of the immunity induced by drug treatment of an infection, the trypanosomes overcome this resistance by emerging with altered immunological characters. We refer to a strain that has arisen in this way as a 'spontaneous variant.'

"B. Twenty-one first relapse strains were obtained by giving a subcurative dose of halarsol to mice infected with the 14-year-old mouse-passage *T. rhodesiense*. The relapse strains were separately maintained in mice, and, after periods ranging between one month and one year since their isolation, immune sera were prepared respectively against each strain and also against a 'spontaneous variant' and the parent stem. The method of obtaining immune serum was by infecting 10 mice with the particular strain, treating with halarsol 2 days later, and killing the mice and pooling their sera after a further 5 days. The respective immune sera were then tested for their trypanolytic action *in vitro* against the organisms of each strain in turn. Conclusions arising from these tests, and from further experiments suggested by the results obtained, are as follows:—

"1. In the 22 relapse strains (among which we include the 'spontaneous variant') 13 distinct immunological trypanosome types appeared.

"2. In 7 of the strains there was a mixture of two, and in 1 strain a mixture of three separate types, with the effect that altogether there were 16 different types or combinations of types in 22 strains. That a relapse strain may include more than one trypanosome type has been confirmed by isolating from a strain two single organisms, the progeny of one of which was then shown to be immunologically different from that of the other.

"3. Certain types tend to appear in relapse strains more frequently than others. Thus, one appeared in as many as 9 of the 22 strains, whereas 8 other types occurred only once.

"4. The factors determining whether one or more types are to appear in the trypanosomes of a relapse, and which particular types these are to be, are quite obscure. Such variables as the date of treatment, size of the subcurative dose, the degree of infection at the time of treatment, and the duration of the latent period between treatment and relapse have all been excluded.

"5. One of the relapse strains proved to be of the same type as the parent stem. Experiments are described to support the view that such a strain arises in the first place as a mixture of relapse type individuals with others still of the parent type, the latter overgrowing and finally displacing the former, in the course of passage from mouse to mouse.

"6. The immune serum produced by a mouse infected with a strain composed of several types is lytic against organisms of each of these types—even though, in the compound strain, the individuals of one type may have been only about $\frac{1}{1000}$ times as numerous as those of another.

"7. It is confirmed that, on passage through mice, the immunological type of the parent, or of relapse, trypanosomes remains fixed for prolonged

periods ; apparently the type may change but once in about 1,000 passages, i.e., once in about 10 years, in a strain inoculated from mouse to mouse at the rate of two passages per week. In strains comprising a mixture of trypanosome types, all the individuals of one or more of these types may at any time be lost, in the course of mouse passage.

" 8. Mouse immune serum may be kept at 0°C. for at least 7 months without any impairment of its trypanocidal property. W. Y.

SCHWETZ (J.). *Trypanosoma suis* Ochmann, 1905, *Trypanosoma porci* Schwetz, 1932 ou *Trypanosoma simiae* Bruce, 1912? A propos de la nomenclature de la trypanosomiase virulente du porc. [The Nomenclature of the Virulent Trypanosome of the Pig.]—*Bull. Soc. Path. Exot.* 1937. June 9. Vol. 30. No. 6. pp. 501-511. [17 refs.]

This paper is a lengthy discussion on the subject of the correct nomenclature of the virulent trypanosome of pigs. It must be consulted in the original by those interested. Schwetz reaches the conclusion that the name *T. suis* should be adopted in place of *T. simiae* for the following reasons :—

1. *T. suis* dates from 1905, *T. simiae* from 1912.
2. It is not logical to call a trypanosome a monkey parasite, when its special character is its virulence for pigs.
3. *T. suis* is a natural infection of pigs, whilst *T. simiae* was described from infections produced by wild *G. morsitans*.

It may be objected that *T. suis* was insufficiently described, but so was *T. simiae*. The latter was originally considered to be a monomorphic trypanosome, but it is now known to be polymorphic. The true pathogenic trypanosome of pigs was described by Schwetz under the name *T. porci*, and if on grounds of priority this name must lapse it should be replaced by *T. suis* and not by *T. simiae*. W. Y.

MELLANBY (Helen) & MELLANBY (Kenneth). **Rearing Tsetse Flies in Captivity.**—Reprinted from *Proc. Roy. Entom. Soc. London*. Ser. A. General Entomology. 1937. Feb. 15. Vol. 12. Pts. 1-2. pp. 1-3.

The authors have maintained a culture of *Glossina palpalis* in England for four generations, the flies increasing slowly. They discuss the difficulties which they have met and ways of surmounting them.

Though it is known that in nature the tsetse fly discovers its host by sight it seems unable to do this in captivity, even if the host is placed in a brightly lit part of the cage, towards which the flies tend to move. The explanation is probably that the whole cage smells of the host and that this confuses the fly and causes it to disregard the stimuli received through its eyes. One cannot therefore maintain tsetse flies in a cage with a bird or mammal, because they will not feed and die of starvation. In captivity, therefore, it is necessary to keep them in a small container and to hold this against the host daily, the best results being obtained with a very small container, for instance a tube 2 in. \times 1½ in. containing a single fly ; this method is exceedingly tedious. Moreover, flies which are really hungry often refuse to feed and may need special attention because they will eventually feed if they are repeatedly put in contact with the host. Care of this sort is particularly necessary if flies are maintained at a low humidity because plentiful

food is needed to counteract the great evaporation ; provided the flies can be fed sufficiently they live and breed well at low humidities.

As to the effects of temperature, it has been already recorded that flies cannot breed if they are maintained continuously at 30°C. for at this temperature the functions of the ovary are abnormal. The low temperature limit is approximately 20°C. because that is the temperature below which flies become inactive ; but they can be kept at lower temperatures than this and will live and feed well if they are warmed from time to time.

Another source of difficulty is to secure that the females are fertilized ; it is by no means sufficient to keep males and females together, for the female ceases to be attractive to males after the first week of her life. It is already known that once the female is fertilized she remains so for life. The present authors kept a female which continued to produce living larvae for more than six months, the spermathecae containing active sperm at death, which occurred 208 days after pairing.

The size of the larva and its survival are influenced to great extent by the amount of blood taken by the mother early in pregnancy. Provided the feeding is adequate larvae are produced regularly.

The work has been done on *G. palpalis*, but subsidiary experiments with several other species showed that in all essentials they resemble one another.

P. A. Buxton.

VAN HOOFF (L.), HENRARD (C.) & PEEL (E.). La piqure de la glossine infectieuse. [**The Bite of Infective Glossina.**].—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 59-62.

The object of this investigation was to ascertain the number of trypanosomes an infected glossina discharged in the act of biting. Reference is made to the early work of BRUCE and his colleagues (1914), who introduced a coverslip between the fly and the skin, so that the fly in attempting to pierce the skin discharged saliva containing trypanosomes on to the slip ; and also to the contemporary work of RODHAIN (1913), who made flies feed on blood through a piece of skin. The experimental technique of the present authors followed closely that of Rodhain. He stretched a piece of skin of rat, mouse or young guineapig over a very small funnel, and then introduced by means of a pipette a measured quantity (about 2 cc.) of citrated blood into the inverted funnel. Infective flies were then fed on the blood through the skin. Details of a number of such experiments are given with *Glossina* infected with *T. gambiense*.

In the first experiment, with infective fly No. 29, examinations of all the blood in the funnel after the feed revealed only 12 trypanosomes. A second experiment performed with the same fly after 4 days' starvation revealed no trypanosomes in the blood, and in a third experiment performed 3 days later only 2 trypanosomes were discovered.

Another experiment performed with fly No. 12 gave negative results on two occasions. After death this fly was dissected, but only a few dead trypanosomes were found in the intestine, the proventriculus and glands were empty. This fly had previously infected a healthy guineapig ; it had died from a massive infection by a long bacillus and the authors inquire whether this bacterial infection had destroyed the trypanosomes.

The general conclusion from this work is that *Glossina* infected with *T. gambiense* discharge only a few trypanosomes when they gorge themselves with blood. It is believed that the blood ascending the proboscis when the fly begins to feed stops the expulsion of infective saliva, and if a large number of trypanosomes are discharged it is only at the time the proboscis pierces the integument. W. Y.

VAN HOOF (L.), HENRARD (C.) & PEEL (E.) L'aptitude de *Glossina palpalis* au développement de *Trypanosoma gambiense* est-elle rustique, raciale ou héréditaire? [*Is the Aptitude of G. palpalis for the Development of T. gambiense Rustic, Racial or Hereditary?*] —C. R. Soc. Biol. 1937. Vol. 125. No. 23. pp. 1037–1039.

For the purpose of investigating these and other questions relating to the development of *T. gambiense* in the tsetse fly, the authors have made use of a strain of *G. palpalis*, which they have bred for many years at Leopoldville, and also of flies hatched from pupae collected in the bush.

In their first experiment the authors used an infected *Cercocebus galeritus agilis*, which gives a large proportion of infections in *G. palpalis* fed upon it. Flies hatched from the domestic pupae gave 28 per cent. of salivary gland infections, whilst those coming from rustic pupae gave 26.6 per cent. When fed upon a sleeping sickness patient the results were respectively 6.24 and 5.2 per cent. There was hence no difference in the susceptibility of the two strains of tsetse fly.

From other experiments it was concluded that *Glossina* hatched from the pupae of infected *Glossina* do not exhibit any acquired immunity to infection, and that the breeding in captivity of tsetse does not modify its capacity of transmitting *T. gambiense*. W. Y.

VAN HOOF (L.), HENRARD (C.) & PEEL (E.). Influences modificatrices de la transmissibilité cyclique du *Trypanosoma gambiense* par *Glossina palpalis*. [*Influences modifying the Transmissibility Cycle of T. gambiense in G. palpalis.*]—Ann. Soc. Belge de Méd. Trop. 1937. June 30. Vol. 17. No. 2. pp. 249–272. With 1 fig.

After referring to DUKE's (1928 and 1935) observations that with laboratory bred tsetse the fact that whether or not they had been fed on clean animals before the infected meal had no influence on their infectibility, the present authors give an account of their own experiments on this matter.

A strain (Wakalenge) of trypanosomes was obtained from a patient at Rutuku, Tanganyika, by inoculating a guineapig with the blood. This guineapig was sent to Leopoldville. Here it was found that the strain was very sensitive to tryparsamide and was moderately transmissible. The strain was passed mechanically into another guineapig and then by cyclical transmission to a series of guineapigs, and finally from one of these a monkey (*Cercocebus galeritis agilis*) was inoculated as was also another guineapig. Between 22nd and 25th July, 1936, 68 *G. palpalis*, which had previously fed several times on a fowl, were fed on the *Cercocebus* and one salivary gland infection was obtained; on the same dates 58 *G. palpalis*, which had not previously been fed, were fed on the same *Cercocebus* and 35 salivary gland infections were obtained. This experiment was repeated with the same results. Experiments of the same kind done on the guineapig gave the following results:—In the first experiment 70 previously fed flies

gave no salivary gland infection, whilst 46 flies, which had not fed previous to the infected meal, gave 2 salivary gland infections; the second experiment gave similar results.

In view of these striking results, the authors performed a series of experiments of the same kind in some of which different strains were used. From their experiments they conclude:—

1. Feeds on non-infected animals previous to the infective feeds diminish notably the aptitude of *G. palpalis* for the development of *T. gambiense*.

2. The monkey *Cercopithecus galeritus agilis* is a host in which *T. gambiense* exhibits a much higher degree of infectivity for *G. palpalis* than it does in the guineapig or even in the patient himself. In *Cercopithecus galeritus* *T. gambiense* produces a much more benign infection than in the guineapig or man.

At the end of this interesting and important paper there is a series of tables in which the various experiments are summarized.

W. Y.

GUIBERT. Expériences de transmission de *Trypanosoma gambiense* de cobaye contaminé à cobaye sain par l'intermédiaire de *Stegomyia fasciata*. [**The Transmission of *T. gambiense* from Infected to Healthy Guinea-pigs by Means of *Stegomyia fasciata*.**]—*Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 136-143. With 4 plates.

Experiments showed that *Stegomyia fasciata* (*Aedes aegypti*) was capable of conveying mechanically *T. gambiense* from infected to healthy guineapigs up to an hour after feeding on the infected animal.

W. Y.

ROBIN (Ch.) & JOSPIN (M.). Sur un cas de transmission expérimentale transplacentaire de *Trypanosoma gambiense* chez le cobaye. [**Experimental Transplacental Transmission of *T. gambiense* in a Guinea-pig.**]—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 372-376. [13 refs.]

A guineapig 23 days pregnant was inoculated intraperitoneally on 29th December, 1937, with 0.5 cc. of blood of another guineapig infected with *T. gambiense*. On 6th February, it gave birth to two young guineapigs, the blood of which was negative. In a table the authors give the results of examination of the mother from 30th December, 1936, until 24th March, 1937; trypanosomes in considerable numbers were found throughout this period.

In a second table the results of examination of the two offsprings are given. The blood of each was negative at birth, but trypanosomes appeared in one of them on the 6th day and in the other on the 8th day after birth.

W. Y.

VAN HOOFF (L.), HENRARD (C.) & PEEL (E.). Sur la transmissibilité cyclique de trypanosomes "Brucei" et "Congolense" conservés depuis longtemps dans les laboratoires. [**On the Cyclical Transmissibility of *T. brucei* and *T. congolense* maintained for a Long Time in the Laboratory.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. Mar. 31. Vol. 17. No. 1. pp. 63-76.

The strain of *T. congolense* used in these experiments was isolated from a pig at Leopoldville in 1927. Between then and 26th July, 1934,

it had been passed by blood inoculation through a series of 226 rats and guineapigs. Various freshly isolated strains of *T. congolense* were used as controls. The strain of *T. brucei* was obtained from Schilling; it had been isolated in East Africa by allowing an infective *Glossina* to bite a mouse in July, 1932. Between this date and 4th September, 1932, it had been passed mechanically through 4 animals and was then sent to Leopoldville. Up to July 1935, the trypanosome had been passaged through a further series of 35 guineapigs and rats.

Examination of the cyclical transmissibility of these two strains showed that the *T. congolense* strain had lost its transmissibility, but that the *T. brucei* strain was still readily transmissible. It was observed that the guineapig is an unsuitable animal for *T. congolense* experiments, because it exhibits a considerable degree of natural resistance to this trypanosome and may even be refractory to the bites of naturally infected *Glossina*. W. Y.

MORENAS (L.) & ROMAN (E.). Transmission héréditaire de *Trypanosoma brucei* chez le rat. [**Hereditary Transmission of *T. brucei* in the Rat.**—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 376-379.

Observations were made on the offspring of 4 rats and 1 guineapig infected with *T. brucei*. In all, 16 young rats and 2 young guineapigs were examined. Of the 16 young rats 2 were found to become infected, 13 remained negative, and 3 cases were doubtful. Neither of the 2 young guineapigs was infected, and subsequent examination showed that they exhibited no immunity to the trypanosome. The conclusion reached is that hereditary transmission of *T. brucei* does occur in the rat, but that it is an exceptional event. W. Y.

GUIBERT (M.). Les glossines du Cameroun. [**Glossina from Cameroons.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 283-286. With 1 fig.

The distribution of the various species of *Glossina* captured in the Cameroons in 1935 and 1936 is shown on a map, and further details are given in a table. The species found were:—*G. tachinoides*, *G. pallicerca*, *G. caliginea*, *G. palpalis*, *G. longipalpis*, *G. morsitans*, and *G. fusca*. By far the commonest species was *G. palpalis*, no less than 4,081 of the 5,790 specimens examined belonged to this species.

W. Y.

CASTELLANI (A.) & JACONO (I.). Osservazioni su un caso di malattia del sonno.—*Riv. di Parassit.* Rome. 1937. July. Vol. 1. No. 3. pp. 195-210. With 16 figs. English summary (3 lines).

ROBIN (Ch.) & JOSPIN (M.). Recherches expérimentales sur *Trypanosoma gambiense*. Présence constante du trypanosome dans la moelle osseuse. Dédutions pour le diagnostic et l'étude de la trypanosomiase humaine. [**Experimental Researches on *T. gambiense*. Constant Presence of the Trypanosome in the Bone Marrow. Deductions for the Diagnosis and Study of Human Trypanosomiasis.**—*Bull. Soc. Path. Exot.* 1937. May 12. Vol. 30. No. 5. pp. 369-372.

The trypanosome with which this paper deals came from a patient infected in the Ivory Coast. The infection was very mild and showed

little tendency to evolution. After a number of attempts the authors succeeded in infecting guineapigs. In the early passages the parasite resembled *T. rhodesiense*—it was polymorphic and exhibited posterior nuclear forms. After about 40 passages the short forms had become very rare and the parasite practically monomorphic; the infection had also become very virulent, the guineapigs dying in from 15–20 days.

In a guineapig killed at the terminal stage of the disease with scanty trypanosomes in the peripheral blood, the interesting observation was made that the bone-marrow contained numerous trypanosomes. The polymorphism of the parasite was remarkable: in addition to the usual blood forms there were others which were probably parasites in a state of degeneration, but still others which were less easy to interpret. These were round forms, with well-defined and well-stained cytoplasm, containing a nucleus and a blepharoplast side by side and without flagellum or undulating membrane. No myocardial changes as described by PERUZZI were observed.

A number of guineapigs were then inoculated intraperitoneally with 0.5 cc. of heavily infected blood. Sixty hours later, examination of the bone-marrow revealed the presence of trypanosomes, whereas the parasites did not appear in the peripheral blood until the 9th to 12th day. Numerous guineapigs sacrificed at all periods of the infection always showed trypanosomes in the bone-marrow.

The authors conclude by suggesting that spinal puncture may be of value in the diagnosis of sleeping sickness in man. W. Y.

VAN DEN BRANDEN (F.). Essais d'utilisation de la réaction au formol-neostibosane et de la réaction au sulfarsenol, dans le diagnostic des trypanosomiasés animales. (Deuxième note.) [**The Formol-Neostibosan and the Sulpharsenol Reactions in the Diagnosis of Animal Trypanosomiasis.**]—*Ann. Soc. Belge de Méd. Trop.* 1937. June 30. Vol. 17. No. 2. pp. 245–246.

In a previous paper (1937), in which the author deals with the use of these tests for the diagnosis of trypanosomiasis in guineapigs, rats and rabbits infected with *T. brucei*, he concludes that the formol-neostibosan reaction gave too small a percentage of positive results to be of practical utility, and that the sulpharsenol test gave no positive results at all.

In the present work he has continued his investigations with guineapigs infected with *T. gambiense*. In this chronic infection the tests were likewise negative. W. Y.

LAUNOY (L.). Du traitement de l'infection expérimentale à "Trypanosoma annamense" de la souris et du cobaye, par l'Sb.-III-thiomalate de lithium (Sb. trivalent) et par les sels de glucamine de l'acide aminophénylstibinique (Sb. pentavalent). [**The Treatment of Experimental *T. annamense* Infections of the Mouse and Guinea-pig with Sb-III-Thiomalate of Lithium and by the Glucamine Salts of Aminophenylstibinic Acid.**]—*Bull. Acad. Méd.* 1937. June 22. 101st Year. 3rd Ser. Vol. 117. No. 24. pp. 743–749.

The author's earlier work on this subject has already been noticed in this *Bulletin*, 1935, Vol. 32, p. 708.

The present investigation showed that the trivalent antimonial (Sb-III-thiomalate of lithium) is active in the mouse and especially in early infections; in later infections cure is obtained in about 50 per

cent. of cases. In the guineapig this compound prolongs the disease, but does not cure. The synergic action of the antimony compound with moranyl is very pronounced in the mouse.

The pentavalent compounds (aminophenylstibinate of glucamine and of methylglucamine) are very active in *T. annamense* infections of the mouse. W. Y.

BROOM (J. C.). & BROWN (H. C.). **Studies in Trypanosomiasis. I.—The Electric Charge of Trypanosomes in Tsetse Flies.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 81–86.

In a previous paper the authors showed that trypanosomes in the blood of infected animals can carry either a negative or a positive electric charge. The present paper deals with the charge of trypanosomes in the tsetse fly.

The strain of trypanosomes used was *T. brucei* obtained from the reviewer. This strain was found by MURGATROYD and YORKE to have lost its transmissibility [this *Bulletin*, 1937, Vol. 34, p. 533]. Broom and Brown's observations confirm this. They found no evidence of salivary gland infection in flies which have shown a heavy gut infection up to 39 days after the infective meal. Altogether 987 flies were dissected at intervals of 11 to 39 days after the infective meal; of these 58 showed gut infection, but there was no salivary gland infection. The fact that the cyclic development in the fly was incomplete has limited somewhat the scope of the present investigation, but certain data were obtained on the electric charge of the organism during its development in the gut of the fly.

The technique employed is described in detail and the following summary of the results of the work is given:—

" 1. The salt-concentration test for the determination of the sign of the charge of trypanosomes has been modified to make it applicable to the study of the charge of the developmental forms in the tsetse fly.

" 2. Negatively charged trypanosomes in the infective feed remain unchanged in the gut of the fly.

" 3. Positively charged trypanosomes become negatively charged after approximately 24 hours.

" 4. Trypanosomes of positive or negative charge retain their infectivity in the fly for the same length of time—namely, about 72 hours.

" 5. Developmental forms are all negatively charged.

W. Y.

GOWE (Donald F.). **Observations on the Relationship between the Leucocyte Picture and the Crisis in the Parasite Number in Experimental Trypanosomiasis.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 401–405. With 2 charts.

This paper contains the results of observations made upon the blood picture of rabbits and rats after infection with *T. brucei*, an attempt being made to determine whether the monocyte accounts in any measure for the comparative resistance of the rabbits to this infection. It was found that in rabbits which resisted infection with the trypanosome there is a significant increase in the relative percentage, and in the total number, of monocytes just prior to the parasite crisis. No such increase in monocytes was found in non-resistant rabbits and rats. It is considered possible that the greater resistance of most rabbits,

as compared with rats, is reflected in their capacity to develop an enhanced number of monocytes.

W. Y.

FAIRBAIRN (H.). **The Infectivity to Man of a Strain of *Trypanosoma rhodesiense* transmitted through Sheep by *Glossina morsitans*, and its Resistance to Human Serum *in vitro*.**—*Ann. Trop. Med. & Parasit.* 1937. July 13. Vol. 31. No. 2. pp. 285–291.

CORSON found that a strain of *T. rhodesiense* isolated from an untreated case of sleeping sickness, and maintained in a series of six sheep through which it was transmitted by *G. morsitans*, was still infective to man 16½ months after isolation [this *Bulletin*, 1936, Vol. 33, p. 651]. Fairbairn has carried on this strain and has proved that it was still capable of infecting man by feeding on himself the flies used to transmit it to the 11th sheep passage 22 months after isolation.

The reaction of the strain to human serum was tested from the 6th animal passage onwards by means of the *in vitro* technique of the reviewer and his colleagues. At each animal passage a number of rats were inoculated by the syringe from the cyclically infected sheep, while a couple of rats, infected directly by the bites of tsetse flies, were also examined to see if the action of the serum was influenced by the method of infecting the rats. The action *in vitro* of normal human serum on the strain at the various animal passages is shown in a table.

This experiment has shown that a strain of *T. rhodesiense*, transmitted through sheep by cyclically infected *G. morsitans*, is still infective for man 22 months after isolation. Despite the fact that at the 9th passage the trypanosomes were susceptible to one sample of the author's serum, and at the 10th passage to 6 samples of serum, yet an infection developed when an infected fly was fed upon him. This appears to confirm previously expressed opinions that the action of serum, *in vivo* and *in vitro*, on a strain is no criterion of the ability of that strain to infect the host furnishing the serum. With regard to human serum, it would almost appear that so long as a strain of *T. rhodesiense* is resistant to any human serum it is capable of infecting any man.

The following is the summary :—

" 1. A strain of *T. rhodesiense*, which had been transmitted by cyclically infected *G. morsitans* through sheep, was still infective to man 22 months after isolation.

" 2. Cyclical transmission of the strain did not appear to have any influence on the action of human serum *in vitro* on the strain, especially when compared with a similar strain which had been transmitted through rats by syringe inoculation.

" 3. It is urged that strains of *T. rhodesiense* maintained for years in European laboratories should now be inoculated into human volunteers, as such inoculations would give immediate data as to the number of years over which *T. rhodesiense* remains infective for man."

W. Y.

CORSON (J. F.). **A Note on the Infectivity to Man of a Strain of *Trypanosoma rhodesiense* maintained in Sheep.**—*Jl. Trop. Med. & Hyg.* 1937. June 15. Vol. 40. No. 12. pp. 141–142.

The following summary is given :—

" A strain of *T. rhodesiense* was transmitted by *G. morsitans* from man to sheep in October, 1934. It was maintained in sheep by fly passages,

and after two years it was transmitted through two reedbucks in succession by isolated *G. morsitans*. The infectivity to man was tested in March, 1936, in August, 1936, and in March, 1937, and in each test the volunteer became infected after an incubation period of six or seven days. So far as can be judged by the incubation period and the onset, the disease would have been of ordinary severity if not immediately treated. It may be taken as sure that the trypanosomes which infected the volunteers were of the strain originally transmitted from man in 1934. There is no reason to think that the strain had become less infective or less virulent to man during the period of twenty-nine months in animals and flies.

"As the skin reaction in natives, though less striking than in light-skinned persons, is so noticeable, it might be useful to tell natives that it may be a sign of infection."

W. Y.

CORSON (J. F.). **The Virulence of *Trypanosoma rhodesiense* in Relation to Cyclical Passage through *Glossina morsitans*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 251–254.

The author mentions that the question whether cyclical passage through *Glossina* has any influence on the characters of polymorphic trypanosomes has been much discussed, and the few experiments which have been made have given inconsistent results. In the present paper Corson is concerned only with change in virulence. Previous work on this matter is briefly summarized, and details of the present experiments are given.

The following are the conclusions:—

"An experiment was made to compare the virulence of a strain of *T. rhodesiense* in two series of guineapigs, the infection being maintained in one series by cyclical transmissions by *G. morsitans* and in the other series by inoculations with a syringe. It was found that the virulence had increased in the latter series and apparently not in the former. This was confirmed by subinoculations into rats and mice. It was also found that this increased virulence was not again decreased by passage through *G. morsitans*.

"Very little is known of the factors concerned with the development of trypanosomes in tsetse flies, and of the influences of the tissues and body fluids of flies and vertebrates on the trypanosomes. ROBERTSON (1929) in an account of experiments with *Bodo caudatus*, discussed the questions of selection, mutation and the heterogeneous composition of strains of trypanosomes. Plausible explanations of the variations in the results of transmission experiments could be based on such considerations. More work with infections by single trypanosomes seems to be needed."

[This work should be compared with the recent work of MURGATROYD and YORKE on the same subject, *vide* this *Bulletin*, 1937, Vol. 34, p. 531.]

W. Y.

GLOWAZKY (Franz). Der Stoffwechsel der Trypanosomen unter der Einwirkung von Chemotherapeutica in vivo. [**The Metabolism of Trypanosomes under the Influence of Chemotherapeutic Substances.**]—*Ztschr. f. Hyg. u. Infektionskr.* 1937. July 3. Vol. 119. No. 6. pp. 741–752. With 27 figs. [13 refs.]

A technique is described whereby the variations in the normal metabolism of trypanosomes can be avoided. These variations are probably due to differences in the metabolic conditions of different animals, and to variations in the stage of infection. This difficulty

was overcome by employing rats instead of mice, so that the infection in the same animal could be examined before and after the administration of the drug. It was found possible by use of infected rats to withdraw by heart puncture 0.6 cc. of blood, and then to administer intramuscularly the drug to be examined, and after a suitable interval again to obtain blood from the animal. In this way a suspension of trypanosomes could be obtained before and after the drug had been given.

Employing this method, the author was able to study the influence of different drugs on the metabolism of the trypanosomes. For the determination of quantitative changes he used the Warburg method, and for the detection of qualitative changes the Tüpfel reaction described by FEIGL. The virulence of the trypanosomes subjected to the action of the drug was also always examined.

The substances examined were :—trypaflavin, sulfoharnstoff, atoxyl, para-aminophenylarsenoxide, germanin and human serum. In the case of trypaflavin, sulfoharnstoff, and arsenoxide, even after only 30 minutes, the trypanosomes exhibited a quantitative change of the aerobe and a qualitative change of the anaerobe sugar metabolism. In the case of atoxyl this action was only manifest after 6 hours. No changes were observed after the action of human serum. Since the virulence of the trypanosomes was undiminished in all experiments, it appears that a disturbance of the trypanosome metabolism is the first sign of the action of a drug. W. Y.

LAUNOY (L.) & FLEURY (O.). Sur la vitesse d'élimination, hors du courant sanguin, de l'arsenic injecté par voie veineuse, sous forme de tryparsamide, à des lapins normaux ou infectés par "*Trypanosoma annamense*." [**On the Rate of Elimination from the Circulating Blood of Arsenic injected in the form of Tryparsamide intravenously into Normal and *T. annamense*-infected Rabbits.**]—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 315–324. [14 refs.]

The rate of elimination from the blood of drugs injected intravenously for chemotherapeutic purposes is a matter of great interest and has already received a good deal of attention. Reference is made to the work of STÜHMER (1924), of ROTHERMUNDT and RICHTER (1935), of RICHTER (1937), of SICÉ (1933), and of MURGATROYD, RUSSELL and YORKE (1934). All these investigators, except the last, were concerned with the rate of disappearance of arsenic from the blood after the injection of various aromatic arsenicals. The last group of workers attempted, by means of a biological test, to investigate the length of sojourn in the blood of the various types of aromatic arsenicals [this *Bulletin*, 1935, Vol. 32, p. 26].

The present authors have investigated the amount of arsenic in the blood of normal, and of trypanosome-infected, rabbits, at various intervals after the intravenous injection of different doses of tryparsamide. A description of their methods is given. Their conclusions are as follows :—

1. The blood of normal rabbits which have been injected intravenously with such a quantity of 8 per cent. sol. of tryparsamide that between 700/1000 and 2660/1000 mgm. of arsenic were given per gm. of blood of the injected animal—doses which are of a therapeutic order—was found to have got rid of 88 to 95 per cent. of the arsenic injected within an hour.

2. After the third to fourth hour only about 1 per cent. of the arsenic injected can be discovered in the blood.

3. Six hours after the injection only 0.1 to 0.4 per cent. of the quantity of arsenic given can be detected in the blood.

4. Imponderable traces of arsenic are still discernible 29 hours after injection, but in order to recognize them it is necessary to work with 10–15 cc. of blood. It is possible that these persistent traces represent arsenic which has been fixed by the tissues and then slowly liberated into the blood in minute quantities. [This view was advanced by the reviewer and his colleagues in order to explain their observations. They concluded that the liberated arsenic was in the trivalent form, and that this accounted for the fact that the blood remained trypanocidal for some considerable time after the administration of a pentavalent arsenical like tryparsamide.]

5. The results with rabbits infected with *T. annamense* were similar to those obtained with normal animals. W. Y.

LAUNOY (L.). Chimio-résistance de *T. annamense* à la suite d'une seule injection massive de tryparsamide, à un chat infecté. [**Drug-Resistance of *T. annamense* following a Single Massive Injection of Tryparsamide in an Infected Cat.**—*Bull. Soc. Path. Exot.* 1937. Mar. 10. Vol. 30. No. 3. pp. 234–236.]

A cat infected with *T. annamense* was treated when in an advanced stage of the disease with a single massive injection of 50 cgm. of tryparsamide per kilo. Three months later it relapsed and mice and guineapigs were sub-inoculated. The infection in these animals exhibited an enhanced resistance to tryparsamide and gonacrine, and also proved less sensitive than the normal strain to "Bayer 205."

W. Y.

GUO (Ko-Da). Die gegenseitige Beeinflussung zwischen pathogenen Trypanosomen und Rekurrensspirochäten bei Mischinfektionen. [**The Antagonistic Action between Pathogenic Trypanosomes and Relapsing Fever Spirochaetes in Mixed Infections.**—*Zent. f. Bakt.* I. Abt. Orig. 1937. June 7. Vol. 139. No. 3/4. pp. 113–125. [15 refs.]

Having given a summary of the work of previous investigators on this subject, the author passes to an account of his own work. He used 3 trypanosome strains, viz.:—*T. congolense*, which had been kept at Hamburg since 1925, and also *T. rhodesiense* and *T. brucei*; and 4 spirochaete strains, viz.:—*Sp. obermeieri* kept in mice since 1935, *Sp. hispanica* obtained from *Ornithodoros maroccanus* in 1935, *Sp. berbera* kept in Hamburg since 1927, and *Sp. duttoni* obtained from *Ornithodoros moubata* in 1907 and since maintained in mice.

In order to ascertain the influence of the spirochaetal infections on the trypanosomal infections, sometimes the parasites were injected simultaneously, and sometimes the spirochaetes were inoculated first, and when the blood was positive the trypanosomes were injected. In view of REICHENOW'S (1934) observation that *T. congolense* was influenced by human serum *in vivo*, the author has administered human serum to animals with mixed infections of spirochaetes and trypanosomes in order to ascertain whether the trypanosomes thus influenced exhibited to any appreciable extent a special reaction to the spirochaete infection.

From his experiments, which are given in detail, the author concludes that in mice which are first infected with one of the above spirochaetes and then with *T. congolense* there is a definite prolongation of the trypanosomal infection. *T. congolense* infections both in rats and mice were influenced by human serum.

It was established that the weaker and the more frequent the paroxysms of the spirochaetal infections, the more definite the inhibitory action on the trypanosomal infection. The author believes that the specific spirochaete antibody acts not only against the spirochaete, but also non-specifically against trypanosomes. W. Y.

RUGE (H.) & RÖPER (E.). VI. Der heutige Stand der Chagaskrankheit mit besonderer Berücksichtigung der Epidemiologie und der Uebertragungsversuche auf Säugetiere. [**The Present Position of Chagas' Disease with Special Reference to the Epidemiology and Transmission Experiments to Mammals.**—Reprinted from *Ergebnisse der Hygiene Bakteriologie Immunitätsforschung und Experimentellen Therapie*. 1937. Vol. 19. pp. 352–463. With 20 figs. [12 pages of refs.]

In their introduction the authors point out that Chagas' disease has a peculiar history in that the transmitter and the causal parasite were discovered before cases of the disease. Even to-day it provides many puzzles for the investigator. Why, for example, does one find in the Brazilian provinces—and especially in that of Minas Geraes—so much goitre, cretinism and Chagas' disease, that Chagas himself suggested the parasite was actually responsible for the goitre and cretinism in addition to the other signs of the disease? This is a matter which has been much discussed. The variation in the severity of the disease in different places is very striking, and it is equally little understood why the transmitter, which is a cosmopolitan insect of the tropics and subtropics, does not spread the disease in other places than South and Central America. A further interesting question is why the drugs which are active in African sleeping sickness and in kala azar are quite inactive in this disease. In view of such considerations the authors consider that even though Chagas' disease may have quite a subsidiary significance in comparison with other infections, it is worth while to present in the German literature a short account of the disease, stressing especially its immuno-biological, pathological and epidemiological aspects.

In the section dealing with the clinical course of the disease, the authors deal with the acute form and with the chronic form in the conventional manner. After discussing the methods of diagnosis, they pass to a description of the causal organism and its development in the insect transmitter. The geographical distribution of the disease is dealt with very fully, and this is followed by an account of the natural infections which have been discovered in various animals, e.g., dogs, cats, armadillos, opossums, bats, monkeys and rats.

The next section is concerned with the very important problem of the relationship of goitre, cretinism and Chagas' disease. As the result of their reflections, the authors conclude that it is at the present time impossible to reach a definite conclusion on this matter. The equally important question of the possible relationship of *T. cruzi* infection to the chronic heart disease, which appears to be so common in many parts of South America, is apparently ignored.

The remaining sections of the work deal with such matters as pathology, experimental infections in animals and culture of the parasite; and at the end of the book is an enormous list of references. The article is undoubtedly a useful summary of the present position of knowledge of this very interesting infection. W. Y.

NIÑO (Flavio L.). Contribución al estudio de la distribución geográfica de la enfermedad de Chagas comparada con la de los triatomas vectores del "*Schizotrypanum Cruzi*," en la República Argentina. [**The Geographical Distribution of Chagas' Disease and that of Triatoma Species compared.**]—*Prensa Méd. Argentina*. 1937. Apr. 21. Vol. 24. No. 16. pp. 813-823. With 1 map. [58 refs.]

This paper cannot be abstracted as the evidence is presented mainly in the form of protocols giving the State and district where Chagas' disease in acute or chronic form has been reported, the year, the recorder and the index of infection when known. It is, consequently, a presentation of the distribution of American trypanosomiasis. The distribution of the vectors is also given and some indication of the parasitic index, of animals domesticated and wild, *i.e.*, the proportions found parasitized. The insects are found fairly generally distributed between 22° and 41° south latitude, but the degree of their infection lessens to the south and east of this area; the distribution and prevalence of disease and insect infestation correspond. H. H. S.

ZUCCARINI (Juan A.). Tripanosomosis americana del hombre o enfermedad de Chagas. Breve reseña de los principales conocimientos relativos a su existencia en la R. Argentina. [**Chagas' Disease in the Argentine.**]—*Semana Méd.* 1937. June 10. Vol. 44. No. 23. pp. 1573-1576.

This is a brief account, too brief because so much information is contained in two and a-half pages that the condensation results in difficult reading and the information partakes of the nature of a chronological catalogue of important discoveries and records. The author traces the history of the disease in the Argentine Republic from 1909 to the present day and has incorporated almost every point of note. In an appended footnote at the end he pays a happy compliment to Professor YORKE for his article in this *Bulletin* [1937, Vol. 34, pp. 275-300], since he discusses chiefly the vector and transmission aspect, whereas Professor Yorke dealt fully with the symptomatology, diagnosis and pathology. H. H. S.

MAZZA (Salvador), COSSIO (Rufino) & ZUCCARDI (E.). Primer caso agudo grave de enfermedad de Chagas comprobado en Tucumán y su tratamiento con *Bayer 7602* (Ac.). [**The First Acute and Severe Case of Chagas' Disease in Tucumán; Treatment with Bayer 7602 (Ac.).**]—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 32. pp. 3-18. With 9 figs.

The case described was severe in degree and occurred in a very young child, only 3 months old when seen. The parents lived in a dwelling heavily infested with *T. infestans*. Another child, aged 6 years, who often visited and sometimes slept there harboured *T. cruzi* and *P. vivax* in his blood, but seemed to be in fair general

health, although the pulse was 120 and there were enlarged glands on the left side of the occiput and neck.

The infant with which this account is concerned was bitten when he was 2½ months old, and facial oedema followed and 20 days later the swelling had become generalized. Infection was heavy; 500 trypanosomes were counted in a thick drop of blood, 10-15 in a single field; the child was very drowsy.

Dr. Mazza resolved to try a new drug, a quinoline derivative, "Bayer 7602 (Ac.)" and in view of the tender age of the patient and the severity of the attack, started with 0.25 cc. of a 3 per cent. solution in water. It was well borne, so the following day 0.5 cc. was given; 4 days later and on the two succeeding days, 1.0 cc., altogether 3.75 cc. By this time the temperature was normal, the oedema was fast disappearing and no trypanosomes could be seen in the blood. Five weeks later the child seemed quite well and lively, and in another 6-7 weeks the blood being still negative, a xeno-diagnostic test was made with three larvae; 54 days later one of these had crithridial forms and metacyclic trypanosomes in its dejecta. The cure, therefore, was not complete, but the amount of the drug given had been small.

H. H. S.

JOHNSON (Carl M.) & KELSER (Raymond A.). **The Incidence of Chagas' Disease in Panama as determined by the Complement-Fixation Test.**—*Amer. Jl. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 385-392.

The authors have made use of the complement fixation test in a survey of the incidence of Chagas' disease in Panama. The antigen was prepared from cultures of *T. cruzi*, as described by Kelsner in a recent paper [this *Bulletin*, 1937, Vol. 34, p. 137]. A table shows the incidence of the disease among 1,251 individuals examined in various localities. In all, 37 gave positive results and 11 suspicious results, the percentage of positive, or suspicious, results being 3.83. The highest incidence of the disease was noted at Ventorillo, where 22.22 per cent. of the 36 persons examined gave positive or suspicious reactions. The following are the conclusions:—

"A survey of the incidence of Chagas' disease in Panama, made through the use of the complement-fixation test, using cultural antigen, indicates, from the blood serum specimens thus far tested, that the disease and human carriers of the organisms are more common than has been generally supposed. Out of 1,251 sera thus far collected from various places in Panama, 37 were positive to the test and 11 gave suspicious reactions, a combined rate of 3.83 per cent.

"The infection rate as determined by the test is low for children under 15 years of age but rises sharply above this age. This may possibly be explained on the basis of a relatively high mortality from the disease in children. This possibility is strengthened by the few clinical observations which have been made in Panama.

"The complement-fixation test, as employed in this survey, is of distinct value, not only in identifying active cases of Chagas' disease, but in revealing the incidence of the infection, past and present." W. Y.

MAZZA (Salvador): Nota a propósito de 240 casos de formas agudas de enfermedad de Chagas comprobadas en el país por la M.E.P.R.A.—*Prensa Méd. Argentina.* 1937. July 14. Vol. 24. No. 28. pp. 1394-1396.

MAZZA (Salvador) & SANCHEZ (Oscar Belmont). Nuevo caso de forma aguda de enfermedad de Chagas comprobado en Arroyito (Córdoba).—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 32. pp. 34–36. With 1 fig.

GACETA MEDICA DE CARACAS. 1936. Oct. 15 & 31. Vol. 43. Nos. 19 & 20. pp. 300–306; 307–309. [21 refs.]—Algo mas sobre la enfermedad de Chagas en Venezuela. Trabajo presentado en el "Concurso Luis Razetti" de 1936.

ZUCCARINI (J. A.). Conservación *in vitro* de la capacidad infestante experimental del *Trypanosoma cruzi* Chagas, 1909. [*Infectibility of Blood in vitro taken from Cases of Chagas' Disease.*]—*Folia Biol.* Buenos Aires. 1936. Sept.–Oct.–Nov.–Dec. Nos. 66–67–68–69. pp. 285–287. English summary (10 lines).

Samples of blood were taken with a Bayer's Venule from two patients exhibiting Romaña's symptom of unilateral conjunctivitis and local adenitis and were found capable of infecting young white rats after 2 and 4 days respectively. Experimental tests were then made to determine the length of time during which samples would remain capable of transmitting infection. A dog was infected and blood from the carotid was taken with a Venule 3a (the blood being found to contain sparse trypanosomes) and kept for varying periods up to 10 days at room temperature, and white rats a few days old were injected intraperitoneally with 0.1 cc. Five animals were inoculated after 2, 4, 6, 8 and 10 days; all became infected, but the period of incubation lengthened from 5 days in those receiving the injection after 2 days, to 16 in those injected after 10 days' interval. The blood sample was received in citrate solution in the venule. H. H. S.

RODHAIN (J.). Notes sur *Trypanosoma minasense* Chagas. [*Notes on Trypanosoma minasense Chagas.*]—*C. R. Soc. Biol.* 1937. Vol. 125. No. 23. pp. 1034–1036. With 3 figs.

The author has found at Antwerp in a monkey (*Chrysothrix sciureus*) coming from Brazil a trypanosome which he identifies with *T. minasense*, first discovered by CHAGAS (1909) in *Hapale (Callithrix) penicillatus*, and a little later by CARINI (1909) in *Hapale jacchus*, by BRUMPT (1909) in the same animal, and again in 1924 by CHAGAS in *Chrysothrix sciureus*.

The morphology of the trypanosome found by Rodhain agrees very closely with the description by Carini. The parasite is non-pathogenic for *Chrysothrix sciureus*, and inoculations into a rat, a mouse, a hamster and a *Macacus rhesus* all failed; it could be cultured with great ease. W. Y.

MAZZA (Salvador) & LOBOS (Martin M.). Casos de enfermedad de Chagas y animales domésticos infectados naturalmente con *S. cruzi* comprobados en el Departamento de Trancas, provincia de Tucumán.—*Universidad Buenos Aires: Misión de Estudios de Patología Regional Argentina Jujuy*. 1937. Publicación No. 32. pp. 18–33. With 10 figs.

MALARIA.

SINTON (J. A.) & RAJA RAM. **Man-made Malaria in India.**—*Health Bull. No. 22. Malaria Bureau No. 10.* 19 pp. With 7 figs. & 1 folding plan. 1936. Delhi: Manager of Publications. [As. 4 or 5d.]

Part I of this Bulletin was published in the *Indian Medical Gazette* (this *Bulletin* 1936, Vol. 33, p. 760). Part II, by Professor Raja Ram, was written chiefly for the benefit of road engineers in India. It describes how roads in India have often, unavoidably, been aligned across the natural drainage system and how this has provided facilities for the breeding of mosquitoes. Suggestions are made as to the manner in which this danger can be eliminated or diminished and a plan is given of a road culvert, with a cunette, that is well designed. The author stresses the importance of collaboration between engineer and malariologist.

Norman White.

BUONOMINI (G.) & GORI (D.). Anofelismo e malaria in alcune zone della provincia di Siena. [**Anophelines and Malaria in Certain Areas of the Province of Siena.**]—*Riv. di Malariologia.* Sez. I. 1937. Vol. 16. No. 2. pp. 142–159. With 4 maps. [16 refs.] German summary.

This is a study of the anopheline fauna of four areas, two to the north and two to the south of the town of Siena. The inquiry has a practical importance in view of the construction of a military aerodrome in the neighbourhood. In the two areas north of the town there is no malaria: here *A. maculipennis* var. *typicus* and var. *atroparvus* and *A. bifurcatus* were found. In the third area sporadic cases of malaria occur; here *superpictus* occurs in addition to the above species. It is not known whether the sporadic cases are attributable to *superpictus* or *atroparvus*; *atroparvus* has not hitherto been considered of importance as a malaria vector in Italy. In the fourth zone where malaria is mildly endemic, *A. maculipennis* var. *labranchiae* was discovered in addition to all the above-named varieties; it is probably responsible for most of the endemic malaria.

N. W.

VLACH (Giuseppe). La malaria in provincia di Trieste. [**Malaria in the Province of Trieste.**]—*Arch. Ital. Sci. Med. Colon. e Parassit.* 1937. Apr. Vol. 18. No. 4. pp. 229–234. With 1 map.

The Province of Trieste has a population of 348,496 (273 per square kilometre). Malaria is mildly endemic in a restricted area in the north-east of the Province but its prevalence is said to be diminishing, thanks to the energetic measures that are taken to combat it. The total cases, including relapses, recorded in 1933, '34 and '35 were 198, 193 and 229 respectively. In the City of Trieste 383 cases were recorded in the 13 years 1923–35; all, or nearly all, were imported cases.

N. W.

BARBER (M. A.), MANDEKOS (A.) & RICE (J. B.). **A Survey (1936) of Malaria among Infants in Greek Macedonia.**—*Amer. Jl. Hyg.* 1937. July. Vol. 26. No. 1. pp. 175–185. With 1 chart.

This paper gives the results of the examination of 483 infants in Greek Macedonia during 1936, which was an unusually malarious year.

All the infants were born on or after November 1st, 1935. The study entailed 1,575 examinations. The infant parasite index indicates that the transmission of malaria began in June, reached its maximum in August and continued in September. The transmission in January to May, October and November was very small, hardly exceeding that which might be expected through pre-natal infection. Older infants are more liable to contract infection than those in the first months of life. Younger infants are less exposed to mosquito bites and possibly have less susceptibility to infection. The number of infants found harbouring malaria parasites on more than one occasion was 104; 45 of these showed on the second or subsequent examination a different species of plasmodium to that found on the first. The change in species diagnosis was usually from *vivax* to *falciparum*. *P. vivax* is less apt to cause enlargement of the spleen and microscopical anaemia than either *falciparum* or *malariae*. In the Plain of Chrysoupolis, which adjoins the mouth of the Nestos River, 68.6 per cent. of the infants exposed to infection during the whole or part of the summer became infected.

N. W.

SU (T. L.) & HUANG (T. F.). **Malaria as a Rural Social Problem in the South-western Suburbs of Shanghai.**—*Chinese Med. Jl.* 1937. June. Vol. 51. No. 6. pp. 963-970.

The inquiry described in this report was carried out by a rural health station in the suburbs of Shanghai. It shows that malaria is responsible for a great deal of sickness. Among 1,211 school children under the age of 12 the spleen rate was 29 and the parasite rate 20. Of the 1,300 patients who visited the health station, 415 were suffering from malaria. Medical relief is primitive; less than a third of the sufferers from malaria had been treated with quinine. More than a half had sought relief in "superstitious measures" or had received no treatment at all. Attacks of fever are of prolonged duration. Malaria contributes very appreciably to the poverty of a very poor peasant population whose housing conditions are miserable.

N. W.

CLARK (Herbert C.). **The First Twelve Months of Infancy as a Test for the Community Incidence of Initial Attacks of Malaria.**—*Southern Med. Jl.* 1937. Aug. Vol. 30. No. 8. pp. 848-850. [12 refs.]

This paper records the results of a study, carried out in rural parts of Panama, of the ages at which babies first acquire malaria infection and of the value of such information as a measure of new infections in an endemic area. In the first two months of life infants appear to be protected from malaria either by something inherited from the mother or associated with the nursing period; no babies were found harbouring parasites before the third month. The normal parasite index for children was not reached in the villages under observation even at the end of the twelfth month, though infections are very numerous at this age. Infants are more exposed to mosquito bites in this area than are adults and older children as they wear practically no clothes. The author considers, however, that the frequency of infant infections during the last ten months of the first year of life is of value as an indication of the frequency of new infections in an endemic region as compared with the frequency of recrudescence and relapse.

N. W.

WILLIAMSON (K. B.). **References and Notes supplementary to "The Control of Rural Malaria by Natural Methods," Series I-III.**—89 pp. With 3 plates. 1936. League of Nations. Eastern Bureau. Singapore.

This useful volume, published primarily for the benefit of medical officers attending the international malariology courses organized by the Health Organisation of the League of Nations, which are held annually in Singapore, is a mine of information concerning "natural methods" of malaria control. It is aptly described by the author as a "running commentary" on all the important papers and reports "bearing upon biochemical, biological and other agents of natural control, which throw light upon the past progress and present state of knowledge of this subject, especially as it relates to Malaya." Reference is also made to papers dealing with little practised artificial methods of control which promise automatic or long continued reduction of mosquito breeding. The rôle of commentator is very ably filled. Eighty-eight papers are fully summarized. Most of these have been noted in this *Bulletin* as they appeared.

In the conclusions of this publication the author states that "without continually repeated systematic instruction of anti-malarial workers in the theory and practice of new methods, these will for the most part remain unknown and unappreciated." He has rendered useful service in making information concerning several little practised methods of malaria control readily accessible. N. W.

BISHOP (E. L.). **Consideration of the Malaria Problem in the Tennessee Valley.**—*Southern Med. J.* 1937. Aug. Vol. 30. No. 8. pp. 858-861.

An interesting discussion of the complex questions involved in the malaria problem of the Tennessee Valley project. The valley is a vast watershed in which more rain falls each year than on any other region of similar size in the United States; it covers an area of some 40,000 square miles. In earlier days most of the rain was held in the soil by reason of its forest and ground cover; then malaria was more severe than it is to-day. Now most of the rainfall reaches the streams by a rapid surface run-off, taking much soil with it; there is too little water and soil for crops. The problem of the Tennessee Valley Authority is to reproduce as far as possible the natural water control of earlier days without reproducing the malaria hazards of those days. When land is drained the result in mosquito control must be weighed against loss of useful life and lowering of ground water level. When water is impounded it must be in such manner as not to increase the hazard of malaria. How these not easily reconcilable aims should be pursued is discussed and the need for the closest co-operation between the different interests concerned is stressed. N. W.

GINSBURG (J. M.). **Studies in reducing Volume of Oil Necessary to kill Mosquito Larvae by incorporating Pyrethrum.**—*Jl. Econom. Entom.* 1937. Apr. Vol. 30. No. 2. pp. 328-332. [Summarized in *Rev. Applied Entom.* Ser. B. 1937. Sept. Vol. 25. Pt. 9. pp. 204-205.]

"In the field, it is usually necessary to apply oil at the rate of 20 to 50 U.S. gallons to an acre of water surface if a film that will kill

mosquito larvae is to be produced. Although by using an emulsion of kerosene containing pyrethrum extract the amount of oil may be reduced to about 3 U.S. gals. per acre, the volume of spray to be transported is not reduced, since about 50 U.S. gals. of the dilute emulsion are usually required to liberate enough oil to form a toxic film. An investigation was therefore undertaken to determine the smallest quantity of pyrethrum that would so increase the toxicity of kerosene that the minimum volume of oil by which it is physically possible uniformly to cover a given area of water would also produce a film toxic to mosquito larvae. From laboratory and field observations, it is estimated that the physical minimum quantity of kerosene or similar light-petroleum distillates ranges from 3 to 6 U.S. gals. per acre. Laboratory tests were carried out on third and fourth-instar larvae of *Aedes sollicitans*, Wlk., and *Culex pipiens*, L., with kerosene containing percentages of pyrethrins ranging from 0.01 to 0.1 applied at rates of about 3 and 6 U.S. gals. per acre and with kerosene alone at rates of 3, 6 and 12 U.S. gals. to the acre. Higher rates were not used, since in the laboratory kerosene alone at 12 U.S. gals. to the acre killed 98 and 98 per cent. of *C. pipiens* and 92 and 99 per cent. of *A. sollicitans* in 2 and 24 hours, respectively.

"*A. sollicitans* proved somewhat more resistant to the pyrethrum-kerosene larvicide than *C. pipiens*. With the latter, when the rate of application was 3 U.S. gals. per acre, it required the addition of 0.02 per cent. pyrethrins (about 0.2 lb. flowers to the U.S. gal.) to produce a mortality equal to the control (kerosene alone at 12 U.S. gals.), namely, 98 per cent. in 2 hours and 100 per cent. in 24. At the rate of 6 U.S. gals. per acre the addition of 0.01 per cent. pyrethrins killed all the larvae within 24 hours, but only 94 per cent. in 2 hours. Thus the minimum amount of pyrethrins in this case would appear to be between 0.01 and 0.02 per cent.

"With *A. sollicitans*, when the rate was 3 or 6 U.S. gals. per acre, it was necessary in both cases to add 0.08 per cent. pyrethrins to produce complete mortality in 2 hours, and 0.02 and 0.01 per cent., respectively, to produce the same result in 24 hours. The control, however, gave only 92 per cent. mortality in 2 hours, and 96 and 94 per cent. mortality were obtained in the same time by adding 0.04 and 0.02 per cent. pyrethrins, respectively. The author considers that the results from the 2-hour period offer a safer index for determining the minimum concentration of pyrethrins than those from the 24-hour period. Thus under laboratory conditions the volume of oil can be reduced from 12 to 3 U.S. gals. per acre by adding pyrethrins at the rate of 0.01-0.04 per cent."

FENG (L. C.). **The Anopheline Mosquitoes and the Epidemiology of Malaria in China.**—*Chinese Med. Jl.* 1937. June. Vol. 51. No. 6. pp. 1005-1020. With 1 map. [13 refs.]

This is a useful summary of nearly all the knowledge hitherto acquired regarding the prevalence and distribution of Anopheles and of malaria in China. A list is given of the 24 species and 6 varieties of Anopheles found in China and their distribution is shown on a map. The more important malaria vectors are indicated. The paper was written more especially for the benefit of public health workers in China, to whom it should be of great assistance.

N. W.

PAN (Joseph S.). **Malaria in Wushih. A Review of 225 Cases.**—*Chinese Med. Jl.* 1937. June. Vol. 51. No. 6. pp. 971-978. With 2 figs. [14 refs.]

Wushih is on the Nanking-Shanghai Railway. Malaria is endemic there. During 1936 there were 225 malaria cases admitted to St. Andrew's Hospital and 261 treated as out-patients, 10.1 per cent. of all patients. Most of the patients admitted had *falciparum* infections: among out-patients quartan infections were most in evidence. *Falciparum* infections were most prevalent in September and October. There was no marked seasonal prevalence of quartan infections which were reported in every month. N. W.

RILEY (George E.), FAUST (Ernest Carroll) & COOK (S. S.). Some Recent Advances in the Epidemiology of Malaria.—*Southern Med. Jl.* 1937. Aug. Vol. 30. No. 8. pp. 856-858. [30 refs.]

RILEY (George E.) & RECTOR (Nelson H.). **Experiences with Minor Drainage in Relation to Malaria Rates in Some Mississippi Delta Counties.**—*Southern Med. Jl.* 1937. Aug. Vol. 30. No. 8. pp. 862-866. With 2 charts.

The Delta region of the Mississippi measures 65 by 180 miles. The major drainage of the Delta, inaugurated 25 to 30 years ago, was completed about 1928. This was intended to reclaim vast swamps for agriculture. The work was carried out with no regard for fundamental principles of malaria control. No attempt was made to drain the ponds and swamps left by this major drainage. In 1929 a programme for malaria control was inaugurated by BOYD: special attention was given to minor drainage. In this paper a study is made of malaria mortality rates, from 1920 to 1933, in (1) four counties in which most minor drainage has been done; (2) four counties in which less minor drainage has been done; and (3) three counties in which practically no minor drainage has been carried out. Group 3 had the highest rates throughout the period; group 1 the lowest. Definite conclusions as to the amount of benefit conferred by minor drainage activity are not warranted. Many other factors have been operative and the groups are not strictly comparable. N. W.

SICAULT (G.). Les microréactions sérologiques du paludisme. Leur valeur épidémiologique. [**Epidemiological Value of Serological Microreactions in Malaria.**]—*Bull. Soc. Path. Exot.* 1937. July 7. Vol. 30. No. 7. pp. 565-569.

Henry's reaction however useful to the malariologist is of little value to the epidemiologist; a well equipped laboratory is needed. For field work the author has employed Villain's reaction, using Villain's artificial melanin (see this *Bulletin*, 1936, Vol. 33, p. 782). As the serum is diluted tenfold a single drop of serum will suffice. Three small test tubes (6×0.5 cm.) are used for each test. The first contains 9 drops NH_4Cl solution 9 o/oo, pH 7-7.2; the second 10 drops of melanin solution, diluted 1 in 5 of NH_4Cl 4.5 o/oo, pH 7-7.2; in the third, control, tube are 10 drops NH_4Cl solution 4.5 o/oo, pH 6-6.2. A drop of serum is placed in the first tube, which is then shaken;

two drops of this diluted serum are then put into each of tubes 2 and 3. Results are read after 3 hours at laboratory temperature; they are easily appreciable to the naked eye. The author used the test, together with spleen and blood examinations, on 472 individuals in Arab encampments. He is satisfied with the results, but he considers the epidemiological interest of these serological reactions as restricted. In areas in which an attempt is being made to eradicate the disease, areas of mild endemicity, however, such a reaction as the one described is of great utility. It enables one to follow the serological curves of the infected and the serological index of the population.

N. W.

NICHOLAS (W. A.). **Notes on Antimalarial Measures in Java.**—*Jl. Malaya Branch Brit. Med. Assoc.* 1937. June. Vol. 1. No. 1. pp. 38-55. With 26 figs. on 8 plates.

An international malariology course organized by the Health Organisation of the League of Nations gave the author of this paper the opportunity of seeing biological methods of malaria control which have achieved so large a measure of success in Java. An interesting and informative paper is one of the results. No new facts are reported, but the salient fact, about malaria in Java and the medical organization of the Netherlands East Indies are well summarized.

N. W.

JORDAN (J.). **Mosquito Larvicidal Measures.**—*Chinese Med. Jl.* 1937. June. Vol. 51. No. 6. pp. 927-936.

This paper contains information regarding the breeding places of mosquitoes in Shanghai and the methods employed to abate the nuisance. Measures are not aimed exclusively at anophelines. Few large towns have as much standing water as has Shanghai. The majority of ponds are used not only for washing clothes but also for washing rice. For this reason Paris green has not been used as a larvicide. Breeding places for culicines which are difficult to treat are the pools contained in the rafts on which high buildings are erected; these are often difficult of access. The only anopheline is *A. hyrcanus* var. *sinensis*; it breeds in grassy furrows left by long disused but previously cultivated land, shady pools and occasionally in creeks. *A. sinensis* prefers cattle sheds to human habitations. The prevalence of malaria has increased in Shanghai in recent years. This may possibly be attributed to road making. Road making in low-lying land creates breeding places and also gives greater facilities for the importation of infection. The larvicide found to be the most effective in local conditions is the pyrethrum-soap-kerosene mixture advocated by GINSBURG. As a "spreader" Permalin W. has been useful. Experiments with *Gambusia* have not given satisfactory results.

N. W.

YAKUSHEV (M. R.). **Anti-Larval Measures against Malarial Mosquitoes in Mill Ponds.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 2. [In Russian pp. 231-237. English summary pp. 237-238.]

In malarious districts mill-ponds constitute no small danger as breeding places of *Anopheles*. The most effective measure is complete

emptying, which can only be done if the construction is such that the "heel" of the pond empties at river level. The pond must be kept empty for 8-9 days, 4 for evaporation in small depressions, 5 for formation of crust over the surface and drying up of aquatic vegetation, prolonged, of course, if the weather is damp. It is best to arrange, if possible, for the mill to work at greatest load in late autumn and early spring and so allow the summer for drying. It is best to empty before pupae appear, otherwise adult mosquitoes may develop; similarly, subsequent drainage should be undertaken in the late larval stages. In the autumn the filling is best arranged for when the daily temperature falls to 15°C., when the development to adult form is prolonged to about 6 weeks. When periodic draining is the rule, the aquatic vegetation should be removed, since the moist residue gives protection to the larvae, and also débris of vegetation passing down with the current should be held back and removed to obviate its carrying away larvae with it.

H. H. S.

SICAULT (G.). Fabrication. Contrôle. Épandage des mélanges larvicides de vert de Paris au Maroc. [**Manufacture, Control and Use of Paris Green Larvicide Mixtures in Morocco.**—*Bull. Soc. Path. Exot.* 1937. July 7. Vol. 30. No. 7. pp. 584-587.]

Paris green as a larvicide is used on a very large scale in Morocco; about three tons, or three hundred tons of the prepared mixture, are used annually. This paper contains details of the methods employed in mixing and employing the mixture and the control exercised and should be of interest to those having occasion to use this larvicide on an extensive scale. Road dust is no longer employed as a diluent; it has been superseded by stone dust ground very fine.

N. W.

SELIVANOV (K. L.). **The Use of Mosquito Traps in the Fumigation of Mosquitoes.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1937. Vol. 6. No. 2. [In Russian pp. 243-248. With 5 figs. English summary pp. 248-249.]

"On the basis of experiments carried out in Azerbaidzhan the author considers that the most satisfactory method of destroying mosquitoes in houses is to fumigate them with any kind of smoke and then catch them in a fly-out mosquito trap (Fermi's method). This method gives excellent results if all the openings in the house are closed and the windows are shaded and the trap is placed as close as possible to the floor. This last condition is necessary since the smoke rises first to the upper parts of the house, and if the trap is placed higher than the floor, access of the mosquitoes to it will soon be cut off by the smoke screen. Three fumigations made in immediate succession to one another in the same house, with the trap placed at different levels, gave the following results—

Fumigation	Position of the trap	Number of Anophelines captured.
1st	At the ceiling	2
2nd	Midway on the wall	17
3rd	On the floor	152

FRAGA (Jocelyn). O combate á malária em Minas.—*Folha Med.* 1937. Aug. 5. Vol. 18. No. 22. pp. 438-439.

GHOSE (A. K.). **A Fatal Case of Cerebral Malaria caused by *Plasmodium malariae*.**—*Indian Med. Gaz.* 1937. July. Vol. 72. No. 7. p. 419.

A coolie suddenly fell down unconscious. There was a history of two similar previous attacks. Five days later he died without fully recovering consciousness. Examination of blood smears revealed a large infection of *Pl. malariae*, a finding which the author considers justifies his diagnosis of cerebral malaria. N. W.

CANOVA (Gaston). L'urticaire palustre. [**Malarial Urticaria.**]—Thèse du Laboratoire de Parasitologie de la Faculté de Médecine d'Alger, No. 11. 68 pp. [Bibliography.] 1936. Algiers.

This thesis is based for the most part on cases reported in medical literature. The conclusion is reached that urticaria as a malarial manifestation does occur. The author inclines to the view that it is an anaphylactic phenomenon caused by the liberation of merozoites into the plasma. The treatment of the malaria by quinine or other efficient remedy cures also the urticaria. N. W.

ZEE (Z. U.) & PATY (R. M.), Jr. **Gangrenous Stomatitis with Special Reference to Subtertian Malaria as an Etiological Factor.**—*Chinese Med. Jl.* 1937. July. Vol. 52. No. 1. pp. 95-100. With 2 figs.

Gangrenous stomatitis or cancrum oris appears to be a fairly common disease in Changchow, Ku. In four years 45 cases were treated in hospital. In 13 the condition was a sequel to measles, in 12 to subtertian malaria and in 10 to fever of unknown origin. Details are given of 9 cases in which gangrenous stomatitis followed subtertian malaria; seven of these cases were either cured or greatly improved by treatment. The anaemia was marked in all cases. There is a tendency to limitation of the ulcerative process if good nourishment and adequate treatment of the malaria be supplied. N. W.

BROC & ABDALLAH (Ben). Les néphrites paludéennes chroniques. [**Chronic Malarial Nephritis.**]—*Tunisie Méd.* 1937. June. Vol. 31. No. 6. pp. 261-266. With 1 graph.

Acute nephritis is rare in malaria. A form of chronic nephritis has been observed among Mohammedan chronic malaria patients and is described in this paper. Some of these patients suffer from defective elimination of chlorides which are retained in the blood and tissues, a condition which is not recognizable clinically. Repeated relapses make such patients liable to chronic nephritis with oedema and albuminuria but with no increase in the nitrogen content of the blood. Such cases are not numerous: they are curable, but subject to relapse. The rôle of exposure to cold and damp in precipitating these attacks is shown by their seasonal prevalence which is that of the rains.

N. W.

ISHIOKA (H.). **On the Intradermal Tuberculin Reaction in Malaria.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa.)* 1937. July. Vol. 36. No. 7 (388). [In Japanese pp. 1502–1521. [48 refs.] English summary p. 1522.] [Summary appears also in *Bulletin of Hygiene.*]

The author carried out the tuberculin test in malarious subjects [number not stated, nor the type of infection except that they "were all chronic cases"], using Old Tuberculin 1 in 4 for von Pirquet and 0.05 cc. of 1.0 and 0.1 per cent. for Mantoux.

The patients were kept under observation for eight weeks, so that repeated examinations were possible. It was found that the intensity of the reaction is decreased in malaria but becomes normal on recovery from the malarial infection, therefore "positive tuberculin rates are low among malarial patients." The weakening of the reaction is more noticed with repeated attacks of fever. Recovery of the reaction begins as soon as treatment has caused the parasites to disappear from the peripheral circulation and has reached normal in 4 weeks.

H. H. S.

AMOEBIASIS AND DYSENTERY.

WESTPHAL (Albert) & GÖNNERT (Rudolf). Ueber die Häufigkeit von *Entamoeba histolytica*-Infektionen in Ländern mit tropischem und gemäßigtem Klima. [*Entamoeba histolytica* Infection Rate in Tropical and Temperate Regions.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1936. Oct. Vol. 40. No. 10. pp. 425-439. With 2 maps. [79 refs.]

By a combination of various methods (direct examination, stained preparations, culture) for the detection of intestinal protozoa 503 persons from tropical and temperate regions were examined. The results have been that for *E. histolytica* infection 83 individuals from the Argentine gave an infection rate of 32.5 per cent., 94 from Brazil 36.2 per cent., 49 from Chile 55.2 per cent., 25 from Mexico 40 per cent., 56 from Spain 21.4 per cent., 95 from Germany 16.9 per cent. From these figures, obtained by examinations carried out at Hamburg, it is clear that the infection rates for *E. histolytica* are higher than has hitherto been supposed. Similar figures were obtained for other intestinal amoebae and flagellates.

C. M. Wenyon.

- i. KOLLER (Martha). Amöbiasis in Neu-Guinea. [**Amoebiasis in New Guinea.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. Sept. Vol. 41. No. 9. pp. 593-604.
- ii. WESTPHAL (Albert). Betrachtungen zur Arbeit von Koller ueber Amöbiasis in Neu-Guinea.—*Ibid.* pp. 604-606.

i. Dr. Martha Koller works in Finschafen, New Guinea, and finds that amoebiasis is widely spread there, both amongst the Europeans and natives. Not only does she claim that this infection manifests itself by dysenteric symptoms, but by all "other recognized forms of amoebiasis"—Amoebic nephritis and cystitis, amoebic bronchitis and pneumonia.

The clinical picture in natives is such a variable one that the diagnosis of amoebiasis is attended by considerable difficulties. Sometimes patients present themselves at the Mission Hospital with quite indefinable symptoms, such as fatiguability, muscle pain or backache, or it may be with a slight cough and pyrexia, and, on clinical examination, few physical signs, save inevitable malarial splenomegaly, can be elicited. Sometimes a few bronchitic rhonchi are audible, yet on microscopic examination active *E. histolytica* and cysts are found in the faeces and almost as frequently in the urine and sputum; sometimes, indeed, in all the excreta at the same time. When treated with emetine, yatren or iodrenal, immediate improvement is to be noted in subjective and objective symptoms.

Another group of sufferers are brought into hospital in a serious condition suffering from severe dysentery.

During the wet season of 1936 many patients were encountered with a severe form of pneumonia, which ran an abnormal course without crisis, and which for the reasons already stated, was attributed to amoebiasis. It is claimed that directly anti-amoebic treatment was instituted, very few cases proved fatal. A number of clinical details are given to illustrate these various points.

Dr. Koller includes bronchial asthma, phlegmasia alba dolens and even thrombophlebitis as amoebic manifestations.

Amongst Europeans, too, amoebiasis is widespread. Out of 129 missionary workers during four years there have been 48 cases of amoebic disease and only 20 with dysenteric symptoms. Four cases could be labelled as amoebic nephritis without any signs of bladder involvement.

Roughly 50 per cent. of natives and about the same proportion of Europeans in New Guinea are suffering from amoebic infection in some form or other. The author indulges in speculations as to the origin and spread of amoebiasis in New Guinea during the last two years. It is thought that it has spread inland from the coast. Possibly it may be a special race or strain of *E. histolytica*, and the suggestion is also made that there exists in this region some peculiar symbiotic alliance of *E. histolytica* with spirochaetes.

ii. The literature of amoebiasis during recent years abounds in quite uncritical speculations of this order, and the evidence brought forward rests upon an almost woeful neglect of the elements of accurate protozoological knowledge or of the underlying pathology of this infection.

Hence the strictures of Dr. A. Westphal commenting upon the paper reviewed above, pointing out that a critical examination should be made of Koller's diagnosis. The underlying fallacy is the neglect of staining in demonstrating pathological amoebae or their cysts, especially by the Heidenhain haematoxylin method. DESCHIENS in 1933 (see this *Bulletin*, 1933, Vol. 30, p. 758) has already emphasized this point in a critical survey of the bizarre forms of amoebiasis which are described from time to time. Westphal finds, for instance, that in 50 per cent. of normal persons by using cultural methods *Trichomonas clongata* is present in the buccal cavity and that probable *E. gingivalis* is often present in the bronchi and lungs when these are diseased. Mistakes are liable to be made in this direction.

Then there are macrophage cells and granulocytes undergoing mitosis, which latter are often regarded as *E. histolytica* cysts. It is well known that various inflammatory pus cells in the urine may be taken for vegetative amoebae and cysts. Considering that the toxin production of amoebic infection is almost negligible as compared with bacterial disease, it is most unlikely that acute conditions producing pronounced leucocytic response could be brought about by amoebiasis. It is also noteworthy that Khouri (1931) during 5 years' experience in Alexandria had searched in vain for amoebic bronchitis, cystitis or nephritis. It is suggested that in future in questionable cases of this kind, wet fixed preparations (sublimate-alcohol) should be packed in cotton wool and despatched to a scientific institute for confirmation.

P. H. Manson-Bahr.

SIMITCH (Tchedomir). Les parasites intestinaux en Serbie du Sud. [*Intestinal Parasites in Southern Serbia.*—*Bull. Office Internat. d'Hyg. Publique*. 1936. May. Vol. 28. No. 5. pp. 861-886.]

In this long paper the author gives a general account of the work he has done on the subject of intestinal helminthic and protozoal infections in Southern Serbia. Most of the information has already

been published. He adopts the view that what most observers regard as small races of *E. histolytica* are actually a distinct species—*E. hartmanni*. He supports BRUMPT in the contention that there have been confused under the name *E. histolytica* two distinct amoebae, the one the true dysentery-producing form and the other *E. dispar*, which never causes dysentery in man or animals and which can only be distinguished from *E. histolytica* by animal experiments. He uses the name *E. minuta* for the carrier phase of *E. histolytica* and he states that this phase may persist for years, during which time the amoebae are living in the lumen and on the surface of the intestine, but not in the intestinal wall. In this condition the infection cannot be distinguished from one of *E. dispar* except by animal experiment, such as the inoculation of the dog. The author arrives at the conclusion, hardly helpful from the point of view of the practical laboratory worker, that one cannot declare an individual to be a carrier of the dysentery amoeba—a carrier of four-nucleated cysts—unless the causative amoebae inoculated to a dog have shown either haematophagic or histophagic properties. He further maintains that dogs which have recovered spontaneously from an *E. dispar* infection are no longer infective with this species, though they readily contract infection with *E. histolytica*. The question is still further complicated by the observation that *E. dispar* is pathogenic to the kitten, though it is claimed that this by no means indicates that it is histophagic or haematophagic in the true sense of the terms. The author has been able to produce an *E. coli* infection of six or seven days' duration in very young dogs by administering cysts orally or amoebae rectally. In the case of one dog infection with *E. hartmanni* of about a week's duration was produced after the animal had been infected with trichomonas.

With reference to the intestinal flagellates, their biological characters are discussed from the point of view of cultivation, resistance to heat, cold, sunlight, Roentgen rays and other factors. Dogs were infected with trichomonas and it is stated that the infection is fatal in animals under two months old. Other animals infected were the rat, cat, fox and pig. The last-named was successfully inoculated with *chilomastix*. Naturally occurring trichomonads of the dog, cat and rat produced infections in man which in some cases have persisted for five years.

C. M. W.

BECKER (B. J. P.). **The Incidence and Diagnosis of Amoebiasis on the Witwatersrand.**—*South African Jl. Med. Sci.* 1937. July. Vol. 2. No. 3. pp. 100–112. With 3 figs. [36 refs.]

To obtain a general notion of the incidence of amoebiasis on the Witwatersrand the autopsies, both of Europeans and natives, at the Johannesburg General Hospital for the five years 1932–36 have been analysed. This, it is acknowledged, though affording some indication, is not a true reflection of the incidence for only those with severe manifestations are admitted to hospital and of these only a relatively small proportion come to autopsy.

Of 1,735 autopsies amoebiasis was the cause of death in 45 or 2.59 per cent.; of these 992 were Europeans and 743 Bantus and the percentages of amoebiasis 1.2 and 4.4 per cent. respectively, nearly four times as common among the latter, the greater incidence being ascribed to poorer sanitary conditions. A graph shows a steadily

rising incidence from year to year among Europeans, whereas among Bantu, after a peak in 1933, the rate has been practically stationary. The age-grouping is shown in the accompanying table.

*Cases of Amoebiasis, 1932-36.
Distribution amongst Age Groups.*

Age Groups	European			Bantu		
	Total P.M.'s	Cases	Per cent.	Total P.M.'s	Cases	Per cent.
0-9 ...	21	0		70	4	5.7
10-19 ...	43	0		50	0	
20-29 ...	104	2	1.9	171	5	2.9
30-39 ...	106	0		176	10	5.7
40-49 ...	161	3	1.9	136	8	5.9
50-59 ...	210	4	1.9	75	4	5.2
60 and over	343	3	0.9	49	2	4.0

It will be noticed that from 1-10 years the disease is as common among Bantu as at the more advanced years from 30 onwards, but that no cases, European or Bantu, were seen in the 10-20 year group.

Recognition of entamoebae in the stools often fails, because too long an interval is allowed to elapse between passing and examination.

H. H. S.

PATWARDHAN (V. T.). Observations on Dysentery and its Treatment on an Isolated Rubber Estate.—*Malayan Med. Jl.* 1937. Aug. Vol. 12. No. 3. pp. 91-92.

On this rubber estate in Perak, F.M.S., ninety cases of dysentery were seen in sixteen months, but the infection was all contracted on the estate. Some of the new recruited labourers came already suffering, and some of the labourers would go out on a holiday and return infected. Of the total, 63 were males, 27 females. *E. histolytica* or its cysts were found in 60 only. Seventy of the patients were between 20 and 40 years of age, five were under 10 years. There were six fatal cases. Emetine was successful with the acute cases, and if relapses occurred carbarsone. Of 25 patients treated with carbarsone three relapsed. Kurchi bark was found useful, especially in the children.

H. H. S.

MORLEDGE (Walker). The Problem of Amebiasis as seen in Oklahoma.—*Southern Med. Jl.* 1937. Feb. Vol. 30. No. 2. pp. 214-217.

Amoebiasis is much more common in Oklahoma than hospital returns would indicate; in other words amoebic infection and cyst-passers exist in considerable numbers but show no symptoms. During the past 10 years nearly 50,000 patients have been admitted to the University Hospital, Oklahoma City, but only in 46 was the diagnosis of amoebiasis made, *i.e.*, less than one per thousand. Examination of 532 persons, three only of whom presented any symptoms pointing to amoebic infection, was made; all were connected with the hospital,

and 43 or 8 per cent. were passing the entamoeba or its cysts. Of the total, 231 were medical students and 10 were positive (4·3 per cent.), 81 were food-handlers and six of these (7·4 per cent.) were carriers.

H. H. S.

YAMAMOTO (Yoshio). **Investigations into Amoebic Dysentery. V. On the Cultivation of *Endamoeba histolytica*. Part II. The Determination of Bacteria contained in the Culture Media (Tanabe-Chiba's) and the Examination of the Influences of Bacteriophage and Some Pathogenic Intestinal Bacteria on the Growth of Amoebae.**—*Jl. Oriental Med.* 1936. Oct. Vol. 25. No. 4. [In Japanese pp. 907-928. With 10 charts. [42 refs.] English summary p. 75.]

In cultures of *E. histolytica* in which the only bacillus present was *Bact. coli commune* the addition of a strong bacterial phage favoured growth of the amoebae for a short time by suppressing the bacteria. Addition to the cultures of amoebae of Shiga's dysentery bacilli, paratyphoid bacilli and cholera vibrios prevented growth of the amoebae.

C. M. W.

YOSEZATO (Morio). **Investigations into Amoebic Dysentery ; Observations of the Biological Character of *E. histolytica*. Part II. On the Oxidation and Reduction of *E. histolytica*.**—*Jl. Oriental Med.* 1936. Oct. Vol. 25. No. 4. [In Japanese pp. 953-972. With 8 coloured figs. on 1 plate. [35 refs.] English summary p. 78.]

By the use of vital stains the author has shown that the cytoplasm of *E. histolytica* is a locality in which oxidation and reduction occur while in the nucleus the latter process alone was demonstrable.

C. M. W.

HAKANSSON (E. G.), with the Technical Assistance of J. F. BUCKNER & H. A. DOWN. **Observations on Chromatoid Bodies in the Cysts of *Entamoeba histolytica*.**—*U.S. Nav. Med. Bull.* 1936. Oct. Vol. 34. No. 4. pp. 478-492. With 4 figs.

It is well known that the chromatoid bodies in the cysts of *E. histolytica* disappear when the cysts are kept in the faeces outside the body. This disappearance, the author finds, will occur also in faeces retained for some time in the colon, so that the disappearance of chromatoid bodies is a function of the age of the cyst. If faecal matter containing cysts from which the chromatoid bodies have disappeared is brought into water chromatoid bodies are re-formed in the cytoplasm by what appears to be a process of condensation. It seems that during the disappearance in faeces the manifest chromatoid material becomes latent and that this again becomes manifest when the cysts are brought into water. In water the chromatoid bodies persist for some time and finally disappear when the cysts are old and degenerating. In certain cases this phenomenon may be used for diagnostic purposes, as unidentifiable small round cysts in faeces, devoid of chromatoid bodies, may, if they are cysts of *E. histolytica*, develop them when kept in water for a few hours. It is noted that chromatoid bodies are best identified in iron haematoxylin preparations.

C. M. W.

TSUCHIYA (H.). **The Effects of Dyes on *Entamoeba histolytica* in Vitro.**—*Jl. Lab. & Clin. Med.* 1936. July. Vol. 21. No. 10. pp. 1028–1035. [12 refs.]

The action of certain dyes, such as gentian violet, acriflavin, malachite green, acid fuchsin, on cysts of *Entamoeba histolytica* has been tested. High concentrations of the dyes were found to kill the cysts, as tested by subsequently washing them and placing them in suitable culture media. Lower concentrations, however, appeared to have an amoebastatic action and to favour the growth of the amoeba hatching from the cysts, apparently because the bacterial growth in the medium was less rapid than in the case of untreated cysts. By exposing amoebae to dyes on a number of occasions, evidence of increased resistance to dyes was obtained. C. M. W.

YAMAMOTO (Yoshio). **Investigations of Amoebic Dysentery. VIII. On the Formation of Antibodies by Amoebic Dysentery.**—*Jl. Oriental Med.* 1936. May. Vol. 24. No. 5. [In Japanese pp. 969–989. [34 refs.] English summary pp. 66–68.]

By the use of various amoebic antigens prepared from cultures of *E. histolytica* it has been possible to demonstrate the existence of specific complement fixing substances in the sera of both acute and carrier cases of infection. The most definite results were obtained by the use of alcoholic and 20 per cent. cholesterolized alcoholic extracts of the amoebae. The intensity of the reactions varies with the degree of tissue invasion by the amoebae. The antibodies gradually disappear from the blood as cure takes place. C. M. W.

KANAI (Takasi). Ueber 3 Fälle von akuter, fortschreitender Peritonitis durch perforation des Tropischen Leberabscess. [**Three Cases of Acute Diffuse Peritonitis from Perforation of Liver Abscess.**]—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa).* 1937. July. Vol. 36. No. 7 (388). [In Japanese pp. 1471–1476. [31 refs.] German summary p. 1477.]

Among 258 cases of acute general peritonitis in the General Hospital at Taihoku in the fifteen-year period 1921–35, three were due to rupture of an hepatic abscess; all three patients were males between 40 and 50 years of age. Symptoms were typical, with sudden onset, but no history of previous dysentery was obtained. In the thick pus numerous typical living *Entamoebae* were seen. Two of the patients died, one recovered. H. H. S.

KAMPMEIER (R. H.) & HINMAN (E. Harold). **Amoebic Dysentery. An Analysis of the Laboratory Data from 400 Cases.**—*Jl. Lab. & Clin. Med.* 1937. July. Vol. 22. No. 10. pp. 985–991.

The 400 cases admitted for amoebic dysentery to the State Charity Hospital, New Orleans, which form the subject of this study cover a period of nearly eight years. All were confirmed by the finding of *E. histolytica* in the faeces or by proctoscope material. The stools of 261 were examined and the entamoeba, in negative or cystic form, was seen in 212 or 81·2 per cent. A single examination only was made in the vast majority of cases, merely for purposes of diagnosis. Proctoscopic examination was made in 299 and ulcers seen in 261 or 87·3 per cent. and active amoebae in 252 or 84·3 per cent.

Haematological studies were also carried out. In 89 an erythrocyte count was made and a slight degree of anaemia was found in the majority; all but nine had a total under 5 million per cmm. but only nine were below 3 million; 23 were between 4 and 5 million and 30 between 3 and 4 million. Haemoglobin values indicated secondary anaemia, but the only method used was the Tallquist. Since the passing of blood in the stools was observed in 313 of the 400 cases, secondary anaemia would be expected. A differential leucocyte count was made in 105 of the patients: 73 or 69.5 per cent. had a polymorphonuclear ratio of 75 per cent. or less and 59 or 56.3 per cent. between 56 and 75 per cent. Thirty-one had a leucocytosis over 10,000 and eleven of these over 15,000 per cmm.; thirty-two had a relative as well as absolute polynucleosis, 23 between 76 and 85 per cent. and 9 over 85 per cent. Twenty-five out of 40 in whom gastric analyses were made showed definite hypochlorhydria and 13 achlorhydria (included in the 25). H. H. S.

HUARD (P.), BOUTAREAU & HACH. Les abcès du foie en Cochinchine et au Tonkin. Etude sur les variations de leur fréquence. [**Abscess of the Liver in Cochin-China and Tonking. Variation in Incidence.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1937. Mar. Vol. 15. No. 3. pp. 267-288. With 2 figs. [9 pages of refs.]

This article is of some historical interest since the period covers three-quarters of a century. The author divides this into seven. Between 1863 and 1872 dysentery was treated with ipecacuanha and abscess of liver was uncommon (judging by the records); between 1882 [? 1872] and 1889, mortality from liver abscess varied from nil to 12 *per annum* among 7,500 troops; in the next three years cases were few, although ipecacuanha was not being prescribed so often. In 1903 it was replaced by naphthol, beta-naphthol by mouth, permanganates, hypochlorites, iodine and silver *per rectum*. During this year there was an epidemic of *bacillary dysentery* [*sic*], and abscess of the liver was alarmingly fatal (perniciosité effrayante). Between 1903 and 1911 Cochin-China became a country noted for cases of liver abscess; but in 1912 emetine came into use and abscesses were less. From that date to the present emetine has been in constant use and hepatic abscess has become very rare. H. H. S.

GORDIN (G. A.). Ein seltener Fall von Amöbenabszess der Leber. [**An Unusual Case of Liver Abscess.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1937. June. Vol. 41. No. 6. pp. 461-462.

A man of 25 years, a navvy (Erdarbeiter), came to the clinic complaining of pain in the right side of the abdomen and chest, shortness of breath and palpitation. The previous year he had malaria and for the past twelve months diarrhoea with passage of blood and mucus, with occasional shivering and, in the evening, rise of temperature. The diarrhoea disappeared without treatment. On examination, he was obviously seriously ill, the slightest movement increased the breathlessness and palpitation and he was cyanosed. Liver was much enlarged, extending from the 4th intercostal space in the mammary line to the umbilicus. Blood examination gave red cells 3,560,000, white 6,000 per cmm., Hb. 65 per cent., colour index 0.9, differential leucocyte count 56.5 per cent. polymorphonuclears, 41.5 lymphocytes,

2 per cent. large monocytes, no eosinophiles. Puncture in the midline between umbilicus and symphysis drew off 5 litres of bloody fluid, but the liver remained the same, and the dyspnoea was not relieved and the general state became worse. The liver dullness increased, upwards to reach the first intercostal space, and puncture in the third interspace drew off a greenish fluid free from bacteria. Empyema was diagnosed and thought to be tuberculous. The patient died three days later and at the autopsy an enormous abscess of the liver was found, about 8 litres of pus being measured, and the vena cava inferior was thrombosed, the heart hypertrophied, the right lung compressed and atelectatic. [No record is made of examination of stools or of the pus or liver for amoebae: the absence of leucocytosis and relative polynucleosis is noteworthy.] *H. H. S.*

HUSTON (J.). Difficulties in the Diagnosis of Subacute Amoebiasis and the Value of Emetine as a Diagnostic Agent.—*Jl. Roy. Army Med. Corps.* 1937. Sept. Vol. 69. No. 3. pp. 157–166. With 1 fig. & 2 charts.

The author recalls to the minds of any who may be in danger of forgetting the fact that there are various forms of subacute amoebiasis of which the diagnosis is obscure, as when the history is negative or misleading, or the onset is insidious and signs indefinite, or, again, as is by no means infrequent, when the entamoeba is not seen in stool examinations. Notes of five cases are given to illustrate these points, and the warning is of value, particularly to those whose experience of tropical practice is brief. *H. H. S.*

LIU (Hsiao-Liang). Ya Tan Tzu—a New Specific for Amebic Dysentery. A Preliminary Report.—*Chinese Med. Jl.* 1937. July. Vol. 52. No. 1. pp. 89–94. With 2 figs.

Ya Tan Tzu is the Chinese name for the seed of *Brucea* sp., called by some *Brucea sumatrana*, by others *B. javanica* and *B. amarissima*. It has been found to contain an alkaloid "brucamarine" and a bitter glucoside "kosamine," but not by all analysts; the seeds contain also a small quantity of a hydrolytic enzyme, 1.8 per cent. of tannin, 20 per cent. of a fatty oil (glycerides of oleic, linolic, stearic and palmitic acids) and two bitter principles.

Preliminary tests were made as to the toxic effects on puppies and rabbits; 3–4 seeds in capsule per kgm. bodyweight caused no disturbance; twice that amount caused nausea and vomiting, and 12 seeds per kgm. resulted in death of a puppy with haemorrhagic gastro-enteritis. The toxic substances are in the bitter fraction, not in the oil.

Tests were also made *in vitro* on a dysentery stool. Two per cent. cold infusion of the powdered seed, freed from the oil, was added and the amoebae "became round and died instantly." The ethereal extract has also an amoebicidal action, but the expressed oil has not.

The author has treated 20 cases of dysentery, acute and chronic, with this remedy, no other being given at the same time. To an adult, 20–50 seeds (shells removed) were given in capsule in one dose or divided doses during the day. If amoebae were still seen after 2 or 3 days, the dose was increased. Analysis of 19 of the patients is presented, 6 acute, 13 chronic. The amoebae were no longer seen

after one day (2 cases), two days (7), three days (4), five days (1), six days (1); no record of the other four cases. Following up the patients, six had 6-10 consecutive negative stools in 10-77 days, average 37 days, four had 2-4 consecutive negative stools in from 3-5 days, and no report of any relapse after 3-8 months. Six relapsed, and further treatment was given; all responded well and two patients reported no trouble after 2 months; in one patient the amoebae persisted, and one had advanced phthisis and died with amoebae still present. In three patients with *Chilomastix* or *Trichomonas* these also disappeared. Toxic symptoms were nausea, vomiting, abdominal pain and purging, but in none were these symptoms severe and they occurred only when the dose was given all at once, never when in divided doses.

The author sums up by saying that the treatment, so far as any deduction can be drawn from so small a number of cases, appears to be effective. The amoebae disappeared from the stools in an average of 2-6 days. The drug is easy to administer, only a few doses are needed and it is cheap. The seeds can be obtained from any Chinese drug store, 20-50 seeds, the dose required for an adult, cost only half a cent, so that for threepence enough can be obtained to treat twenty patients.

H. H. S.

[In connexion with the above, Messrs. Burroughs Wellcome & Co., in the *Lancet* (Oct. 9th, 1937, p. 882) state that as long ago as 1905 a paper was read at the British Pharmaceutical Conference, held at Bristol, detailing studies on these seeds, under the name *Kô-sam* seeds, the work being carried out at the Wellcome Chemical Research Laboratories, and two years later they put upon the market "Tabloid" *Kô-sam*, each containing 0.2 gm. of the seeds of *Brucea sumatrana*. Ya Tan Tzu therefore, if a specific, is not a "new specific."]

H. H. S.

SCOTTI (Ciro). **Iodoform in the Treatment of Amoebic Colitis.**—*Jl. Trop. Med. & Hyg.* 1937. Aug. 2. Vol. 40. No. 15. pp. 174-176.

The treatment of intestinal amoebiasis by iodoform has been strongly advocated by CASTELLANI [see this *Bulletin*, 1936, Vol. 33, p. 546]. The author details eight cases under his observation treated in the following way: A saline purgative, 25-30 gm. of magnesium sulphate was given and the resulting stools examined for *E. histolytica*. If they were present the patient was kept in bed, given a light diet, and iodoform taken in keratinized capsules, in doses of 0.05 gm., increasing to a maximum daily of 0.2 or 0.3 gm. The course of treatment usually lasted 12-20 days, and the stools were again examined after a saline purge.

Some of the patients had had courses of emetine previously. Seven no longer showed any *Entamoebae* after the iodoform treatment, one continued to pass them (emetine had been tried in this case without success). All improved in clinical symptoms and in their general state, none gave any signs of intolerance, either a rash or intestinal disturbance, due to the drug.

H. H. S.

CHOPRA (R. N.), SEN (B.) & GUPTA (J. C.). **Yatren in Infection with Indian Strains of *E. histolytica* (Chronic Intestinal Amoebiasis).**—*Indian Med. Gaz.* 1937. June. Vol. 72. No. 6. pp. 348-353.

This article records the results of the treatment of 50 patients in the Carmichael Hospital for Tropical Diseases who were admitted on

account of dysentery associated with vegetative or cystic forms of *E. histolytica*, or, if admitted for some other disease, were passing the parasite in their stools.

The yatren (7-iodo-8 hydroxy-quinoline-5 sulphonic acid) was given in the form of pillules, 4 or 1 gm. twice daily for ten, or if necessary for fifteen days. The original dose proposed was 1 gm. thrice daily, but Indian patients could not tolerate this on account of the severe diarrhoea set up. If the sigmoidoscope showed the presence of ulcers a 2 per cent. solution of yatren was employed for rectal lavage. Cure was recorded if six examinations of the stools on different days after cessation of treatment revealed no entamoeba.

Details are presented in a table giving the age and sex of the patients, duration of disease, the laboratory findings before and after treatment, nature and duration of treatment and the result.

Twenty-eight of the fifty were cured; 16 others left hospital before the requisite number of stools had been examined. One patient, a man of 34 years, ill for 18 months, showed *E. histolytica* in the cystic form after treatment but vegetative only prior to the treatment. The proportion of cures was rather higher in the cyst-passers, as shown in the accompanying table.

<i>E. histolytica</i>	Cured, per cent.	Indeterminate (with favourable prognosis), per cent.	Failed, per cent.
Cystic form	62.9	29.6	7.5
Vegetative form	57.9	15.9	26.2

No untoward symptoms were observed as a result of the treatment; diarrhoea might come on after the second day but was rarely troublesome, though it continued till treatment ceased. The drug is therefore certainly worth trying in amoebiasis of the intestine, whether acute or chronic, and is of special value in patients with renal or hepatic conditions and in cases of dermatitis in which carbarsone is inadvisable.

H. H. S.

YOKOYAMA (Tamon). **Dysentery in Dairen. Part I. Epidemiological Survey.**—*Jl. Oriental Med.* 1937. Aug. Vol. 27. No. 2. [In Japanese pp. 131-138. With 1 chart. [10 refs.] English summary p. 12.] [Summary appears also in *Bulletin of Hygiene*.]

Bacillary dysentery is common in Dairen, Manchuria. The author has studied the returns of the past five years. It headed the list of notifiable diseases and constituted one-third of the total; the fatality rate was very high, 38.1 per cent. The average incidence during the five-year period of investigation was 3.4 per mille. In 1934 the incidence in Dairen was nearly seven times that of any Japanese town with a similar population. It was found in all months of the year, but most in August and September. *Bact. dysenteriae* Shiga was rarely found, most of the infections were by "metadysentery" organisms. The disease was commonest in the young, the age group chiefly attacked being 1-5 years, and the 20-30 year group next. The most heavily infected area was the Sakako district with Kasunicho as the centre.

H. H. S.

YAWS AND SYPHILIS.

STANNUS (Hugh S.). **Yaws-Syphilis.**—Empire Social Hygiene Year Book. 1936. Part III. pp. 577-620.

The relationship of yaws and syphilis remains a problem of considerable interest to many. Attempts have been made from time to time to formulate lists of similar or dissimilar characters of the two diseases. That tables of differential characters are liable to give rise to false impressions formed the text of a paper by Professor BLACKLOCK* on yaws and syphilis reprinted in this *Bulletin*, 1933, Vol. 30. p. 739.

In the present article (communicated at the Meeting of the Medical Section, British Social Hygiene Council, July 12th, 1934) the author examines the propositions put forward by Professor BLACKLOCK and the arguments used. Read together the two papers serve to bring out forcibly the difficulties which the problem presents. He discusses, in some detail, in comparing the two diseases, aetiological factors, geographical distribution, climate, local incidence, race, sex, etc., clinical manifestations—skin eruptions, mucous membrane lesions—and pathology with a view to showing that the facts as far as they are known are capable in many cases of being interpreted otherwise than as by Professor BLACKLOCK. Dr. Stannus pleads throughout for greater precision in observation, greater accuracy in description and more detail in presentation, pointing out how much that has been published on yaws is lacking in these features. *H. S. Stannus.*

TURNER (Thomas B.). **Studies on the Relationship between Yaws and Syphilis.**—*Amer. Jl. Hyg.* 1937. May. Vol. 25. No. 3. pp. 477-506. [28 refs.]

An interesting and important contribution to the discussion upon the relationship of yaws and syphilis in that it comes from the pen of a member of the Jamaica Yaws Commission based on observations made in Jamaica, upon work done in the Laboratories of the International Health Division at the Rockefeller Institute for Medical Research in New York, and thirdly upon a clinical and epidemiological study of syphilis among negroes at the Baltimore Clinic.

The author sets out to try and answer two questions—whether in fact there are easily demonstrable differences between certain aspects of the clinico-epidemiologic syndrome to which the name yaws has been applied and that to which the name syphilis has been given; and secondly, if such differences do exist, whether they are due to differences in the host or the environment to which the host is subjected, or to inherent biological differences in the infecting organism.

He finds that "in their natural environment yaws and syphilis display clinical and epidemiological features which in general render it possible to distinguish the one disease from the other. Examination of various factors that might be responsible for the differences between the two syndromes makes it seem unlikely that factors such as race of the affected individual, the age of the person at the time of infection, the portal of entry of the infectious agent or the mode of life of the

* *Ann. Trop. Med. & Parasit.* 1932. Vol. 26. No. 3. p. 423.

affected person play an influential rôle in determining the character of the disease picture." There is a good deal of evidence that the epidemiology of yaws is influenced by certain climatic and geological conditions, which, though they play no part in the response of the individual to the infection, do affect some factor lying outside the host, probably an insect vector of the *Hippelates* genus. Syphilis, on the other hand, is not influenced, as far as is known, by any factor outside the human host.

The clinical course of both yaws and syphilis occurring among persons living in essentially the same environment is unaffected by factors within the host or in the environment. On the other hand, by animal experiment the author has shown the spirochaetes of yaws and syphilis, respectively morphologically indistinguishable, to possess biological properties which easily differentiate them, and he concludes therefrom that the differences noted between the syndrome of yaws and that of syphilis are due, in part at least, to inherent biological differences between *T. pertenue* and *T. pallidum*. H. S. S.

CHAMBERS (H. D.). **Further Light on the "Yaws-Syphilis" Problem.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. July 31. Vol. 31. No. 2. pp. 245-250.

The histories of two cases of mother, father and child, in some detail, which go to show that if yaws does confer some immunity to syphilis, that immunity is not complete at all events in all cases. A third case is cited in which the mother became infected with yaws in the later months of pregnancy and the disease remained active after the birth of a healthy child, which remained well during the subsequent three months it remained under observation. It is not possible to summarize these cases, but detailed observations of the kind are very valuable in the study of the problem at issue. H. S. S.

HASSELMANN (C. M.). **What is Yaws? and What is Syphilis?**—Reprinted from *St. Luke's Hospital Alumnae Assoc. News Letter*. 1937. Jan. Vol. 14. No. 1. pp. 3-10. With 3 figs.

Writing from the skin clinic, St. Luke's Hospital, Manila, the author gives a résumé of the well known facts upon which the individuality of yaws and of syphilis is based without adding any new facts.

H. H. S.

JAMAICA. **Report of the Jamaica Yaws Commission for 1935** [SAUNDERS (G. M.), Director].—20 pp. With 1 plate, 2 maps, 6 charts & 7 figs. 1936. Kingston: Govt. Printing Office.
— **Annual Report of the Jamaica Yaws Commission for 1936** [SAUNDERS (George M.), Director, CHAMBERS (Henry D.), Med. Officer, Unit I, & RERRIE (James I.), Medical Officer, Unit II].—20 pp. With 2 maps. 1936. Kingston: Govt. Printing Office.

With the publication of the last report the Commission completed its fifth year of work. Having accomplished its main object, *viz.*, the

development of a practical method of yaws control, the Yaws Commission as constituted under the auspices of the Rockefeller Foundation ceased to function on 31st March, 1937. The campaign after that date is to be carried on by the Jamaica Government.

The two last reports follow the lines of those previously issued; themselves of the nature of summaries, they are difficult to summarize.

The magnitude of the work carried out by the Commission during the five years 1932-36 may be gauged by the following figures:—

Year	Areas surveyed	Total population	Number of yaws cases treated	Total No. of treatments	W. R. and Flocculation Tests
1932 ...			590	2,728	16,000
1933 ...	5	12,605	2,616	10,541	26,444
1934 ...	7	22,578	4,844	21,856	26,767
1935 ...	8	35,323	8,337	45,755	15,162
1936 ...	8	38,487	7,923	45,721	25,671
	28	108,993	24,310	126,601	110,044

Of the several methods that might be postulated for the control of the disease, immunization of susceptibles, protection from infection, cure of individual cases or control of sources of infection by treatment—the last mentioned was considered to be the one offering the best chance at the present time. The Commission has shown that definite practical control of yaws can be attained by the treatment of infected persons. The method involves a systematic preliminary survey, a short course of treatment (six weekly injections) and “follow-up” at 4 to 8 months intervals with treatment of relapsed cases.

It was found that the number of infectious cases discovered at intervals after the original treatment diminishes very rapidly up to six months, after which there appears to be a slow but continuous decrease, rather more apparent with treatment by neoarsphenamine than by bismuth salicylate. The original average attack rate per 1,000 total population was 58 and among non-immunes 120 per thousand. After the first control year these were diminished by 87 per cent.; for the second year by 85 per cent., and for the third year by 87 per cent. The attack rate was diminished 8 per cent. more using neoarsphenamine than when bismuth was given. Six injections as the course of treatment were more effective than four. The necessity for “follow-up” and treatment is shown by the statement that one-third of cases of all types of yaws relapse within 2½ years.

The reversal of the Wassermann reaction as the result of treatment occurs most often in infective cases, less frequently in latent cases, and least in non-infectious cases. The percentage of reversals increases with the number of injections given, being marked up to three or four but much less marked thereafter. A higher percentage of reversals was noted after bismuth than after neoarsphenamine, but the number of injections of bismuth was greater.

After six months the W.R. was reversed in 33 per cent. neoarsphenamine cases, 47 per cent. bismuth cases; after three years the

figures were 60 and 72 per cent. [These figures, however, include cases that had had follow-up treatment.] Bismuth salicylate appears to be the more practical form of treatment and is cheaper. Mixed treatment possesses no advantages.

Regarding aetiology the distribution of yaws in Jamaica has been shown to be closely associated with climate. There is a positive correlation between the incidence of yaws and rainfall; further, more luxuriant lesions occur in areas of greater precipitation and infectious relapse occurs in great part in the rainy season. Whether the association is a direct one or whether indirect is uncertain. Greater precipitation spells more luxuriant vegetation, greater liability to trauma and possibly an increase in the number of flies which may act as vectors. Infection in yaws is probably in the great majority of cases due to contact but the part possibly played by *Hippelates* flies cannot be neglected. They are found in large numbers in all the areas where yaws is prevalent, but also in some where there is no yaws. Among the clinical observations recorded:—110 cases of juxta-articular nodules were noted; 7 per mille of yaws cases and 2 per mille persons classified as non-yaws. 33 cases of teno-synovitis were observed: 31 among 7,800 cases of yaws (4 per mille), 2 in 800 non-yaws (2.5 per mille). There is, however, no certitude that non-yaws persons had not had yaws. Both types of lesions often responded well to treatment. Spirochaetes were not demonstrated in J.A.N. Bone lesions probably occur in the majority of cases of yaws judging by "bone-pain" complained of; in 15 per cent. objective swelling and tenderness occurred.

In an attempt to analyse the evidence in favour of the belief, held by some observers, that yaws may cause nervous lesions, a study was made upon entire populations to see if any correlation existed between the two. Some 100 persons exhibiting nervous lesions were found in a total population of 57,000 examined, among whom the yaws incidence was 56.6 per cent. For these neurological cases the yaws incidence was 80 per cent., or expressed another way, there were 2.5 neurological cases per thousand yaws patients and 1.2 per thousand non-yaws cases.

The observers in Jamaica believe that yaws was a causal factor of the neurological lesion in most of these cases among the rural population in which no other obvious cause was present. The cases recorded include 22 with hemiplegia, 19 paraplegia, 4 G.P.I., 5 facial paralysis, 11 poliomyelitis and 10 others—all these had had yaws. Among those with no history of yaws but positive W.R. were: 3 hemiplegia, 2 paraplegia, 4 tabes. Those with no history of yaws and negative W.R. included: 2 hemiplegia, 4 post polio-paralysis, 5 others. These observations are suggestive but proof is not yet forthcoming. In the opposite direction an attempt was made to estimate the incidence of syphilis in the urban population of Kingston. 1,104 children aged 5-14 years attending schools in that town yielded 3.9 per cent. positive W.R. 3 per cent. were yaws cases, 2.7 per cent. were probably congenital syphilitics. From these and other considerations the figure of 3 per cent. is arrived at as probably representing the incidence of congenital syphilis among Kingston school children and 10 per cent. as representing the incidence of syphilis in the entire population, i.e., about half the incidence of syphilis among the coloured population of the southern United States. [Such figures would appear, however, very rough estimates.]

H. S. S.

CARTON. Le pian et sa répartition dans les colonies françaises. Considérations étiologiques, cliniques, sérologiques, thérapeutiques, et prophylactiques. [*Yaws in the French Colonies.*—*Bull. Office Internat. d'Hyg. Publique.* 1937. Mar. Vol. 29. No. 3. pp. 541-594. With 1 map. [77 refs.] Also in *Ann. de Méd. et de Pharm. Colon.* 1937. Jan.-Feb.-Mar. Vol. 35. No. 1. pp. 5-73. [76 refs.]

A long communication made to the permanent Committee of the Office Internationale d'Hygiène Publique, the chief value of which for the English reader consists in the facts gathered together in regard to the incidence of yaws in France's colonies.

Among other points to which allusion is made are—the patchy distribution of the disease in any one colony, the heavy incidence in some areas and small number of cases in others which are contiguous, the rapid spread in some places while in others the endemic is static, the practical disappearance in some countries as in French Guiana, facts which are well recognized in our own colonies. Again in some countries yaws would appear to be a long established disease, in others to be of quite recent importation. In Oceania the disease is widespread, in New Caledonia, the New Hebrides, Loyalty, Wallis and Futuna islands. For Madagascar and the Comoro islands the figures for 1934 were 5,118 children, 1,526 men and 2,559 women.

There is a heavy incidence in Indo-China, but the figures given for cases in hospital give little idea of the incidence of the disease among the village inhabitants for Tonking, Annam, Camboge Laos and Cochin-China.

The returns for French Equatorial Africa are by no means complete. Rare in the north of the Tchad province, in the south 2 or 3 per cent. of the population are affected. The highest incidence would appear to occur in Oubanghi-Chari province where 20 per cent. of the children are attacked and up to half the patients admitted to hospital are suffering from this disease and some 20,000 cases are treated each year at dispensaries. Rather similar conditions are found in the Middle Congo and Gabon provinces.

In French West Africa the disease is rampant in the Ivory Coast, Guinea and Dahomey, the figures being in 1934, 68,581, 42,032 and 25,735 cases respectively; on the other hand, in Senegal, Mauritania, French Niger and Sudan the incidence is low. In the mandated territories of Togoland and Cameroun the disease is widespread and the incidence high, the number of cases of yaws for 1934 being given as 31,346 and 42,064.

In a second section of the paper aetiological factors are discussed without bringing any fresh light upon the problem and no mention is made of the possibility of an insect vector playing a part as has been suggested by work in our own colonies. Similarly, in the section devoted to clinical manifestations no new facts are chronicled but reference is made to the observations of DE RAUDRE concerning the characteristic marked sensitiveness of the yaws patient to cold.

Other observations of interest concern the very different incidence of goundou, gangosa and juxta-articular nodules in different countries where yaws is endemic. Common in the Ivory Coast the author states that goundou is rare in Cameroun and Guinea for instance and unknown in Indo-China and Madagascar. Gangosa he finds common in Oceania, but extremely rare in Cochin-China but commoner

in Cameroun. Concerning J.A.N. no definite pronouncement is made. A fifth section is devoted to treatment based upon the observations of others, already noted in this *Bulletin*.
H. S. S.

PAZ OTERO (Gerardo). La campaña contra el pian en el departamento del Cauca. [**Yaws Campaign in Cauca (Colombia).**]*—Rev. de Higiene.* Bogota. 1936. May. Vol. 17. No. 3. pp. 85-91.

The Department of Cauca is situated on the Pacific coast of Colombia and has an area of 8,128 sq. kilometres, with a population of about 28,000, scattered so that the average is about 8 or in some parts only 3 per sq. km. The rise from the plains is gradual; the climate is hot, humid and generally unhealthy, and common diseases are malaria, yaws and "tropical anaemia" [*? ankylostomiasis*]. Two dispensaries, one at Guapi and another at Timbiquí, have been set up as centres for dealing with yaws patients; a third is to be established in Lopez. In 9 months 2,100 patients have received treatment and 505 have been reported as "clinical cures." The proportion would certainly have been greater but for the patients ceasing to come for treatment after the first two or three injections. Another retarding factor is the general state of poor nutrition. At 29 schools visited 1,174 children were examined and 824 or 70 per cent. were suffering from yaws, and it is estimated that the number in the Department is approximately 18,000. [The article refers more than once to graphs, but these have been omitted in the paper as printed.]
H. H. S.

LOPES (Cid Ferreira). A campanha contra a boubá no Nordeste Mineiro. [**The Campaign against Yaws in the North-East of Minas.**]*—*Palestra feita na Associação Medico-Cirurgica de Minas Geraes, na sessão de 22 de Agosto de 1935. 31 pp. With 23 figs. (2 maps). English summary. 1935. Bello Horizonte.

A short article announcing the discovery of yaws in the north-eastern part of the province of Minas Geraes, Brazil. The disease is limited to the hot humid forest zones, the hot dry areas being free; it attacks the poorer and rural classes. The disease is probably of recent introduction, from Parahyba and Bahia, as the incidence is greatest over the age of 15 years. It is known locally as "Catita." Forty to fifty per cent. of the population are infected. Clinically the affection does not vary from that seen elsewhere, except that tertiary lesions are not common, but osteitis and periostitis with the production of "sabre tibia" are seen. One case of gangosa but none of goundou or juxta-articular nodules had been seen.
H. S. S.

NICHOLLS (Lucius). **Framboesia Tropica—a Short Review of a Colonial Report concerning Statistics and *Hippelates flavipes*.***—Ann. Trop. Med. & Parasit.* 1936. Oct. 21. Vol. 30. No. 3. pp. 331-335. With 1 chart.

This short article is a summary of a report made to the government of St. Lucia for the half-year ending 30th September, 1911, in which a statistical study of all the cases of yaws patients isolated in yaws asylums during the years 1882 to 1910 was presented.

The re-publication of these facts has been doubtless stimulated by the findings of the Jamaica Yaws Commission. Nicholls had noted in

St. Lucia what the Yaws Commission has demonstrated since, firstly the association between the rainfall and increase in the number of cases of yaws and secondly the close association of a fly, then labelled *Osinis pallipes* by the British Museum but since identified as *Hippelates flavipes*, with yaws.
H. S. S.

LAMBORN (W. A.). **The Experimental Transmission to Man of *Treponema pertenue* by the Fly *Musca sorbens*, Wd.**—*Jl. Trop. Med. & Hyg.* 1936. Oct. 15. Vol. 39. No. 20. pp. 235-239. [18 refs.]

A paper giving details of the successful transmission of yaws by *Musca sorbens* in Nyasaland.

This fly, having fed upon a yaws sore, regurgitates the treponema in its vomit drop. This may happen when it is feeding later on a clean wound and infection result. This was experimentally determined, a treponema-positive infection being produced in a native volunteer. References to previous ideas concerning insect vectors in yaws are given and an account of the life history of this particular Muscid.

H. S. S.

CICCHITTO (Angelo M.). **Reinfezione e superinfezione nella framboesia tropicale. [Reinfection and Superinfection in Yaws].**—*Giorn. Ital. di Clin. Trop.* 1937. Jan. 30. Vol. 1. N.S. No. 1. pp. 16-20. With 5 figs.

The author gives notes of four cases, all Somalis. The first, a man of 22 years, suffered from yaws in 1933 with secondary eruption, all clearing up without treatment, but leaving a lesion on the front of the left elbow. Early in 1934, another exanthem appeared on face, neck, chest and upper limbs which was cured by arsenobenzol intravenously. The second was a man of 24 years, infected in 1934, the symptoms again clearing without treatment, to be followed in 1935 by a primary yaw on the dorsum of the right foot, cured by arsenobenzol. The third, aged 26 years, showed a generalized yaws eruption from January-March 1935, clearing untreated. In December the same year an eruption of small rounded papules the size of millet seed appeared on arms and chest, and disappeared when treated with arsenobenzol. The fourth was a woman of 34 years, who suffered from yaws four years ago and was cured by intravenous injections of arsenobenzol. Five months ago she went to live with a man who had a skin affection recognized as yaws. Two months ago she developed a primary yaw on the left wrist and the rash became generalized a few days later. Arsenobenzol intravenously brought about a cure.

[The first cure is not altogether convincing. The record, especially the last, is of much interest, as affording evidence that one attack does not confer lasting immunity. Also, had the second "primary" yaw been genitally situated, the condition would have been, in all probability, diagnosed as syphilitic. Thirdly, it is noteworthy that all four were adults.]

The author expresses the opinion that the more generalized the eruption the greater the immunity; that when the eruption is slight the immunity developed is weak and re-infection or superinfection is more likely to occur.

H. H. S.

HUDSON (Ellis H.). **Bejel: the Endemic Syphilis of the Euphrates Arab.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1937. June 25. Vol. 31. No. 1. pp. 9–33. With 18 figs. on 4 plates & 1 map. [18 refs.] Discussion pp. 34–46. [Summary appears also in *Bulletin of Hygiene.*]

This author describes a form of non-venereal syphilis which is endemic among the Arab population of part of the Syrian Desert on the middle Euphrates—and calls it Bejel. This disease in some degree resembles venereal syphilis on the one hand and yaws on the other. The former is found in this region only amongst the townspeople and is known as “franghi”; bejel, on the other hand, occurs amongst the Bedouins, who regard it as a disease of childhood, do not associate it with sexual infection and speak of it without shame. Moreover these Bedouins live away from the towns, do not visit brothels and do not touch alcohol; their moral code is a high one, they do not tolerate sexual promiscuity, and rape is severely punished and gonorrhoea is unknown amongst them. These considerations, which suggest that bejel is propagated non-venereally, are supported by statistics of patients examined, and by the fact that two-thirds of bejel is acquired in childhood. Infection takes place by contagion, due largely to lack of hygiene; no primary chancre has been seen, the first signs usually being desquamating patches in the mouth, which swarm with organisms indistinguishable from the *Sp. pallida*, and papules which form on the skin in moist situations. These early lesions usually disappear in about a year, to be followed after a considerable interval by late lesions, which include ulceration of the soft tissues at the back of the mouth, and others involving skin and bones. [Excellent photographs show these very well.] General adenopathy is characteristic of the disease; alopecia is not uncommon, but cardiovascular lesions are very rarely seen. The central nervous system seems to be almost immune, though a few cases with mild changes in the cerebrospinal fluid have been recorded. Pre-natal infection has not been observed—in other words, congenital bejel probably does not exist. Serum reactions—Wassermann and Kahn—are positive in practically all cases and remain so for years and even for life in the untreated. Treatment should aim at the eradication of the disease from the community by preventing the occurrence of new cases; this can be done by treating all those with open lesions—and the drug of choice is bismuth. The patients will not submit to long “courses” of the drug, and it is seldom possible to give any one patient more than a few injections; arsphenamine is not a practical proposition. It is suggested that bejel occupies an intermediate position between syphilis and yaws; that it is an ancient disease and that it is the archetype of syphilis.

In the discussion which followed the reading of this paper Prof. BLACKLOCK discussed the possible identity of syphilis and yaws and suggested that the partial treatment of bejel might possibly conduce to neuro-sequelae. Col. HARRISON compared bejel with a disease encountered by MACQUEEN in Palestine, and thought that a pentavalent arsenical by mouth might be a useful form of treatment. Neurosyphilis includes both the vascular and parenchymatous forms and it was important to distinguish between the two. Absence of miscarriages (pre-natal infection) might be due to the mother having

been infected in childhood and it was possible that a primary sore might occur in the mouth, *e.g.*, on the tonsil.

Dr. STANNUS discussed the relations between syphilis, bejel and yaws, and doubted if bejel was a link in the syphilis-yaws chain.

Dr. HANSCHALL thought that the spirochaete of bejel was different from that of syphilis, and that the two were not the same disease owing to the difference in the skin lesions and the fact that bejel never invaded the parenchyma of the central nervous system nor affected the foetus.

Dr. P. MANSON-BAHR thought that all spirochaetes of syphilis and yaws were originally the same, but had developed along different lines as a result of local conditions.

Dr. C. C. CHESTERMAN thought that bejel resembled yaws rather than syphilis, except that yaws did not show alopecia nor mucous membrane involvement.

Dr. Wm. CORNER had seen bejel amongst the Arabs on the Tigris below Mosul, 200 miles east of Dr. Hudson's region. The common manifestations were mucous patches in the mouth and leucoplakia of the inner aspect of the cheek. In a letter from Col. Harrison, which is appended, distinction is drawn between syphilis of sexual origin and endemic syphilis—from an epidemiological point of view. The Scandinavian countries are quoted as employing the term *Syphiloid* in reference to the latter.

T. E. Osmond.

LE GAC (P.), ESPLAN (G.) & MOUSTARDIER (G.). A propos du goundou. [**On Goundou.**].—*Bull. Soc. Path. Exot.* 1937. Apr. 14. Vol. 30. No. 4. pp. 287-294. With 1 fig. [90 refs.]

From time to time cases have been published having some superficial resemblance to goundou—cases to which the designation pseudo-goundou has been applied.

The case now described belongs to this category—a 63-year-old native of Madagascar exhibiting symmetrical paranasal tumours which, on removal, proved to be simple fibromata. Yaws was denied, but the authors on the strength of positive serological reactions (Vernes) state that the patient was a syphilitic. The tumours were said to have been present from a very early age. Radiological examination had demonstrated that they contained no bony elements. The photograph shows a condition which clinically would with difficulty be distinguished from goundou.

H. S. S.

PIERINI (Luis E.) & BOSQ (Pablo). Nudosidades yuxta-articulares. [**Juxta-articular Nodules.**].—*Prensa Méd. Argentina.* 1936. Nov. 4. Vol. 23. No. 45. pp. 2517-2523. With 9 figs.

The patient was a woman of 45 years, married at 18 years, had four children born alive but dead since, one aged 15 years dying of some acute pulmonary condition, two in childhood from scarlet fever, and the other of "debility" (cause unknown); she had had three miscarriages. Her husband had suffered from venereal disease. She herself stated that she had had no illness, but 5 years ago had burned her left arm on a tray of preserves, and 2 years after noticed a swelling near the elbow. A year ago swellings appeared on the right arm. When seen by the author there were three tumours along the extensor aspect of the left arm, adherent to the periosteum, and three on the

right less firmly adherent. She gave a positive W.R. and Kahn. A tumour was removed; histologically, it was made up of fibroma tissue, the vessels showing distinct thickening of the intima and peripheral infiltration. The facts that there was an indirect venereal history, that the serological tests for syphilis were positive, that the patient had not come from the tropics are sufficient to warrant the syphilitic nature of the nodules.

H. H. S.

WILSON (C.). **The Treatment of Yaws with Acetylarsan.**—*West African Med. J.* 1937. June. Vol. 9. No. 2. pp. 28-31.

The author comes to the conclusion that in acetylarsan we have a very useful remedy for yaws. Though its action is not so rapid as that of neosalvarsan, it is cheaper. It appears to be superior to bismuth in that the injections are painless and no stomatitis results, though of course bismuth is cheaper.

Most of the cases were crab-yaws and these and gangosa responded well—clinical cure being obtained in a good proportion after one or two courses totalling 8-10 injections; at the same time in early cases a reversal of the positive Kahn reaction was seen. The series is, however, too small and the period of observation too short to really allow of an evaluation of this treatment, but further trial is warranted.

H. S. S.

AQUINO (H.). A terapeutica da bouba pelo arsenico pentavalente *Hospital.* Rio de Janeiro. 1937. Jan. Vol. 11 No. 1. pp. 103-107.

SAUNDERS (George M.). **The Control of Yaws by an Intensive Treatment Method.**—*Amer. J. Trop. Med.* 1937. May. Vol. 17. No. 3. pp. 335-347.

An interesting paper for those engaged in anti-yaws campaigns, detailing the aim, the method employed and the results obtained by the measures adopted by the Jamaica Yaws Commission.

TABLE.

All areas. Estimated attack rates per 1,000 total population and per 1,000 non-immune population for one year before treatment and for the first, second, and third control years.

Period	Number of areas	Total population	Number of new infections	Attack rate per 1,000	Percent. decrease in attack rate	Estimated number of non-immunes	Attack rate per 1,000	Percent. decrease in attack rate
Year before treatment	9	21,900	1,243	56.7	0.0	10,405	119.5	0.0
First control year ...	9	21,900	160	7.3	87.1	10,405	15.4	87.1
Second control year ...	9	21,900	180	8.2	85.5	10,405	17.3	85.5
Year before treatment	4	9,800	474	48.4	0.0	4,730	100.2	0.0
Third control year ...	4	9,800	55	5.6	87.4	4,730	11.6	87.4

The aim should be to render all infectious cases non-infective and to insure as far as possible against infectious relapse. The method

employed consisted in a yaws survey by trained inspectors followed by treatment carried out by a semi-mobile field unit with follow-up visitations at four and eight months intervals. The area treated was 7×15 miles in extent with 22,000 inhabitants and a yaws incidence of 40-65 per cent.

Treatment consisted of 6 injections at weekly intervals of either neoarsphenamine or bismuth salicylate. The results are given in the table.

H. S. S.

HOFFMANN (E.). **Experimental Frambesia.**—*Bull. Soc. Française Dermat. et Syph.* 1936. June. Vol. 43. p. 1200. [Summarized in *Veneréal Dis. Information*. 1937. Apr. Vol. 18. No. 4. p. 114.]

"The author has shown experimentally that the primary lesion of yaws and that of syphilis differ essentially. The former is superficial, as distinguished from the deep infiltration of the syphilis chancre.

"The author found the South American marmoset a valuable experimental animal for both syphilis and yaws. He inoculated the upper eyelid of these animals with yaws and after 29 days lesions appeared which differed distinctly from those of syphilis. Fifty days after the positive inoculation with yaws they were inoculated with syphilis with positive results; these inoculations were in the genital region and produced ulcerated lesions with infiltrated bases. This disproved the theory of Levaditi that these two diseases are the same. These animals are also useful in evaluating the virulence of apparently pure cultures of *Spirochaeta pallida*. All the author's experiments however with the strains of Kroó, Reiter and his own were negative.

"The essential difference between frambesia and syphilis in tropical countries in monkeys and man is that the spirochetes of the former invade the ectoderm and those of the latter the mesoderm. That is probably the reason why immunity develops later in yaws than in syphilis and why the former disease is not transmitted through the placenta. Syphilis is generally transmitted through the genital tract while yaws is transmitted through the skin. It has been found however that with a special technic the virus of yaws can be transmitted to the testicle and epididymis of the rabbit and kept up through a series of passages, though the latter requires special care."

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The bracketed abbreviations after the page numbers indicate the subjects.
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Am. signifies Amoebiasis and Amoebic
Dysentery.
Bb. " Beriberi and Epidemic Dropsy.
Bl. " Blackwater.
B.R. " Book Review.
Chl. " Cholera.
Der. " Tropical Dermatology.
Dys. " Dysentery (Bacillary and
Unclassed).
Fev. " Fevers.
Hel. " Helminthiasis.
Leish. " Leishmaniasis.
Lep. " Leprosy.
Lept. " Leptospirosis.

Mal. signifies Malaria.
Misc. " Miscellaneous.
Oph. " Tropical Ophthalmology.
Pel. " Pellagra.
Pl. " Plague.
Rab. " Rabies.
R.B.F. " Rat-Bite Fever.
R.F. " Relapsing Fever and other
Spirochaetoses.
Sp. " Sprue.
Tryp. " Trypanosomiasis.
Vms. " Venoms and Antivenenes.
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Y. & S. " Yaws and Syphilis.

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 (Hel.)
 Chagas, E., 569 (Leish.)
 — & Castro, G. de O., 569 (Leish.)
 —, with da Cunha, 569 *bis* (Leish.)
 Chaimson, H., with Thurmon, 440 (Misc.)
 Chambers, H. D., 959 (Y. & S.)
 —, with Saunders & Rerrie, 959 (Y. & S.)
 Chandler, A. C., (39) (Hel.)
 Chang, K., with Smyly, 509 (Misc.)
 Chaoulitch, S., 589 (Mal.)
 Chaudhuri, H. P., with Strickland, 57 (Mal.)
 Chaudhuri, R. N., with Chopra & De, (434)
 (Misc.)
 Chelarescu, M., with Ciuca, Ballif &
 Lavrinenko, 156 (Mal.)
 Cheluvvarayan, C., with Rao, 217 (Mal.)
 Chen, H. T., 17, 803 (Hel.)
 Ch'en, M. P. & Ch'eng, Y. L., 237 (Rab.)
 Ch'eng, Y. L., with Ch'en, 237 (Rab.)
 Chesterman, C. C., 668 (B.R.)
 Cheverton, R. L., 733 (Vms.)
 Chick, E., (23) (Hel.)
 Chin, K., 595 (Mal.)
 Ch'in, K. Y., 24 (Hel.)
 Ch'in, Y.-T., 883 (Hel.)
 Chinn, A., with Spies & McLester, 434 (Misc.)
 Chiodi, V., 247 (Misc.)
 Chiranji Lal, with Smith & Mukerjee, 570
 (Leish.)
 Chodzko, W., 705 (Lept.)

- Chopra, R. N., 267 (Misc.), 270 (B.R.)
 —, with Banerji & Ray, 331 (Dys.)
 —, Chaudhuri & De, (434) (Misc.)
 —, Das Gupta, B. M. & Roy, A. C., 626 (Mal.)
 —, Ganguly, S. K. & Roy, A. C., 66 (Mal.)
 — & Roy, A. C., 627 (Mal.)
 —, Sen, B. & Gupta, J. C., 956 (Am.)
 —, — & Roy, A. C., 596 (Mal.)
 Chorine, V., 319 (Lep.), 571 (Leish.), 589 (Mal.)
 —, with Marchoux, 309 (Lep.)
 Chouragui, R., 20 (Hel.)
 Chow, C. Y., with Hsu, 802 (Hel.)
 Chowdhury, K. L., 380 (Mal.)
 — & Ganguli, A. C., 684 (Y.F.)
 Christophers, S. R., 736 (B.R.), 781 (Mal.)
 —, Sinton, J. A. & Covell, G., 773 (Mal.)
 Chrobok, E., with Breinl, 847 (Fev.)
 Chu, H. J., with Sun, Yao & Wu, 44 (Leish.)
 Chu, T.-C., Liu, B. C., Ling, C. Y. & Zee, G. F., (386) (Hel.)
 Chung, H.-L., 43 (Leish.), 352 (R. F.), 457 (Hel.)
 — & Feng, L.-C., 352 (R.F.)
 —, with —, 353, 702 (R.F.)
 Chvaliova, M. A., with Sokolov, 382 (Mal.)
 Ciccio, I., 49 (Leish.)
 Ciaudo, P., with Giraud & Bernard, 46 (Leish.)
 Cicchitto, A. M., 514 *bis*, 812 (Misc.), 964 (Y. & S.)
 Ciferri, R. & Redaelli, P., 510 (Misc.)
 —, with —, 510 *bis* (Misc.)
 —, — & Scatizzi, I., (251) (Misc.)
 Ciuca, M., Ballif, I., Chelarescu, M. & Lavrinenko, M., 156 (Mal.)
 Clapham, P. A., 450 (Hel.)
 Clark, A., (441) (Misc.)
 Clark, E. M., 698 (R.F.)
 Clark, H. C., 940 (Mal.)
 — & Komp, W. H. W., 620 (Mal.)
 Clastrier, J., 47 (Leish.), 809 (Misc.)
 Clavier, G. P., (464) (Hel.)
 Clayton, G. E. B. & Derrick, E. H., 704 (Lept.)
 Clements, F. W., 436 (Misc.)
 Clouston, T. M., 310, 601 (Lep.)
 Clow, A. D., with Webster, 671 (Rab.)
 Clutterbuck, P. W., with Wills & Evans, 501 (Misc.)
 Coatney, G. R. & Roudabush, R. L., 511 (Misc.)
 Cochrane, R. G., 302, 305 *ter* (Lep.)
 — & Raj, M. P., 612, 916 (Lep.)
 —, de Simon, D. S. & Fernando, A. C., (606) (Lep.)
 Cocioba, I., with Combiesco-Popesco, 424 (Chl.)
 Coias-Belcour, J., with Roubaud, 109 (Tryp.), 633 (Mal.), 891 (Hel.)
 Cole, H. I. & Cardoso, H. T., 315, 613 (Lep.)
 Coles, A. C., 674 (Rab.), 855 (Fev.)
 Collier, W. A. & Verhoog, M. J., 134, 553 (Tryp.)
 Collignon, E., (383) (Mal.)
 — & Ambialet, R., 162 (Mal.)
 Collins, B. J., with Hall, 880 *bis* (Hel.)
 Colonial Development Fund (Malaria Research Scheme), 141 (Mal.)
 Comaroff, R., with Kligler, 476 (Fev.)
 Combaudon, E., (210) (Mal.)
 Combiesco-Popesco, C. & Cocioba, I., 424 (Chl.)
 Comsia, O., with Zolog, 131 *ter* (Tryp.)
 Conant, N. F., with Martin & Baker, 176 (Der.)
 Condoyannis, N. D., 840 (Bl.)
 Congo Belge, 523 (Tryp.)
 Cook, S. S., with Riley & Faust, (943) (Mal.)
 Cooke, W. E., Gregg, A. L. & Manson-Bahr, P. H., 545 (Tryp.)
 Coombs, H. I., 254 (Misc.)
 Corcuff, C., 509 (Misc.)
 Cordier, G. & Ménager, J., 673 (Rab.)
 Cormack, R. P., 244 (Misc.)
 Cornelson, D. A., with Mezincesco, Lazar & Buşilă, 159 (Mal.)
 Cornet, E., 900 (Oph.)
 Corradetti, A., 47 (Leish.), 214, 718 (Mal.)
 Corrêa, R., 376 (Mal.)
 Corson, J. F., 114, 115, 531, 560, 561, 921, 931, 932 (Tryp.)
 Cort, W. W., 392 (Hel.)
 Cossio, R., with Mazza & Zuccardi, 936 (Tryp.)
 Costa, H. de M., 610 (Lep.)
 Cotrufo, P., with Mallardo, 583 (Mal.)
 Courdurier, with Bonnin, 326 *bis* (Dys.)
 Courtelen, F., 21 (Hel.)
 Couto, M., Jr., 565 (Tryp.)
 Couzi, G., with Marchat, 861 (Hel.)
 Covaceanu, C., with Simici & Popescu, 335 (Dys.), 515 (Misc.)
 Covell, G., 773 (Mal.)
 — & Afridi, M. K., 638 (Mal.)
 — & Baily, J. D., 53, 54 (Mal.)
 —, with Christophers & Sinton, 773 (Mal.)
 —, McGuire, J. P., Stephens, E. D. & Lahiri, B. N., 236 (Rab.)
 — & Mehta, D. R., 472 (Fev.)
 Craciun, E., with Danielopolu, Lupu & Petresco, 483 (Fev.)
 Craig, C. F., 327, 329 (Dys.)
 Craig, G. M., 322, 323 (Dys.)
 Craig, W. J. F., (372) (Mal.)
 Crandall, N. F., 262, 502 (Misc.)
 Crawford, R. P., 674 (Rab.)
 Crawford-Jones, C., (436) (Misc.)
 Crescentino, H., with Uriarte, Morales Villazón & Anchezar, 409 (Pl.)
 Cros, M., (210) (Mal.)
 Cruickshank, A., 244 (Misc.)
 Cruveilhier, L., with Hagenau & Viala, 678 (Rab.)
 Cruz, W. O., 28 (Hel.)
 Cuénod, A. & Nataf, R., 900, 901 (Oph.)
 Culbertson, J. T., 15 (Hel.)
 Cullinan, E. R., with Brodribb, 268 (Misc.)
 Cummer, C. L., 182 (Der.)
 Cumming, H. S., 25, 874 (Hel.)
 da Cunha, A. M. & Chagas, E., 569 *bis* (Leish.)
 Cunningham, J. & Fraser, A. G. L., 701 (R.F.)
 Current Titles from Biological Journals, 742 (B.R.)

D.

- Dahr, P. & Hagemann, P., 81 (Sp.)
 Damboviceanu, A. & Vasilescu, C., 426 (Chl.)
 Dampf, A., 468 (Hel.)

- Dang-van-Ngu, with Galliard & Phan-huy-Quat, (16) (Hel.)
 Danielopolu, D., Lupu, N. G., Craciun, E. & Petresco, M., 483 (Fev.)
 Danilova, M. & Lappine, G., 172 (Mal.)
 Darbes, with Simon, 207 (Mal.)
 Darré, H., Mollaret, P., Tanguy, Y. & Mercier, P., 546 (Tryp.)
 Darriba, A. R., with Abril Cánovas, 509 (Misc.)
 Darwis, A., 309 (Lep.)
 Das Gupta, B. M., with Chopra & Roy, 626 (Mal.)
 —, with Knowles, 508 (Misc.)
 Das Gupta, C. R., with Napier, 500 (Misc.)
 Datta Roy, B. K., with Pandit & Maitra, 427 (Chl.)
 Dauer, C. C. & Faust, E. C., 147 (Mal.)
 Dave, M. L., with Allen, 250 (Misc.)
 Davey, T. H., with Findlay, 343 (Y.F.)
 —, with Gordon, 268 (Misc.), 477 (Fev.)
 Davies, J. R., (152) (Mal.)
 Davis, G. E., 356 (R.F.)
 Day, H. B., 863 (Hel.)
 De, N., with Chopra & Chaudhuri, (434) (Misc.)
 De, N. K., with Lowe, 915 (Lep.)
 De, R. K., 776 (Mal.)
 De, S. S., with Ghosh, (648) (Vms.)
 Decherd, G. M., Jr., 776 (Mal.)
 Decourt, P., 591 (Mal.)
 —, Dupoux, R., Belfort & Henry C., 65 (Mal.)
 —, Marini, C. & Henry, C., (161) (Mal.)
 De la Barrera, J. M., 409 (Pl.)
 Delbove, P. & Nguyen-van-Huong, 851 (Fev.)
 —, with Ragiot, 480 (Fev.)
 Deleonardi, S., with Greppi, (331) (Dys.)
 Del Pino, A. P., with Bacardi, 22 (Hel.)
 Demina, N. A., with Moshkovsky, Nossina, Epstein, Melikhan-Shenina, Basina, Pavlova & Wunder, 856 (Fev.)
 —, with —, —, Pavlova, Livschitz & Wunder, 856 (Fev.)
 —, with — & Pavlova, 856 (Fev.)
 —, with Moshkovsky, Russinkovskaia & Pavlova, 856 (Fev.)
 Denecke, K., 794 (Hel.)
 Daniel, 208 (Mal.)
 Denney, O. E., 304 (Lep.)
 Dennis, E. W., with Turner & Kassis, 21 (Hel.)
 Derrick, E. H., 499 (Misc.)
 —, with Clayton, 704 (Lept.)
 Deschiens, R., 322 *bis*, 325 *bis* (Dys.)
 —, with Dopter, 322 (Dys.)
 — & Flye Sainte-Marie, P. E., 323 (Dys.)
 Des Essarts, J. Q. & Lefrou, G., 310, 914 (Lep.)
 —, with —, 308 (Lep.)
 Des Plaines Valley Mosquito Abatement District, 262 (Misc.)
 Destribats, with Sanner & Albrand, 888 (Hel.)
 Deutschman, S., 519 (Tryp.)
 Devignat, R., with Vincke, 788 (Pl.)
 Dey, A. C., 727 (Vms.)
 Dey, N. C. & Maplestone, P. A., 178, 179 (Der.)
 DeYoung, W., 328 (Dys.)
 Dezeit, G., 686 (Y.F.)
 Dhar, J., 258 (Misc.)
 Dias, E., 137 (Tryp.)
 — & Martins, A. V., 844 (Fev.)
 —, — & Ribeiro, D. J., 845 (Fev.)
 Dickson, J. G., 227 (Bl.)
 Diehl, F. & Schwoerer, P., 872 (Hel.)
 Dieuaide, F. R., 273 (B.R.)
 Dikshit, B. B., 156 (Mal.)
 Diliberto, U., with Ascoli, Missiroli, Bonfigli, Casu, Musumeci, Riolo, Rocca & Terenzio, 618 (Mal.)
 Dimissas, C. A., 223 (Bl.)
 Dimitriu, O., with Zotta & Radacovici, 866 (Hel.)
 Dimitry, T. J., 491 (Oph.)
 Dios, R. L., de Somerville, E. T. W., Bonacci, H. & Aldao, J. F. A., 563 (Tryp.)
 Diss, A., 867 (Hel.)
 Diwan Chand, with Hicks, 443 (Misc.)
 Dobell, C., 506, 507 (Misc.)
 Dobreff, M., 720 (Vms.)
 Dobson, D. C., 436 (Misc.)
 Dodero, J., with Genevray, 672 (Rab.)
 Donatien, A. & Lestoquard, F., 575 (Leish.)
 —, with —, 45 (Leish.)
 Donskow, G. D. & Lochow, M. G., 414 (Pl.)
 Doorenbos, W., 419 (Chl.)
 Dopmeyer, A. L., 415 (Pl.)
 Dopter, C. & Deschiens, R., 322 (Dys.)
 Dornickx, C. G. J., with Pot, 359 (Lept.)
 Dorolle, P., 206 (Mal.)
 Dostrovsky, A., 577 (Leish.)
 —, with Druckman, 49 (Leish.)
 Dow, D. P., 308 (Lep.)
 Dowling, J. D., with Baker & McAlpine, 231 (Rab.)
 Down, H. A., with Hakansson & Buckner, 952 (Am.)
 Drbohlav, J., 581 (Mal.)
 Dreosti, A. O., 811 (Misc.)
 Drinker, C. K., with Augustine & Field, 35 (Hel.)
 Druckman, A. & Dostrowsky, A., 49 (Leish.)
 Du, S. D. & Best, A. E., 41 (Leish.)
 Dubois, A., 44 (Leish.), 128, 129 (Tryp.)
 —, Gavrilov, W. & van Breuseghem, R., 608 (Lep.)
 Dubowskoj, P. A., with Lawrow, 578 (Leish.)
 Duke, H. L., 107, 108, 526, 527, 528, 529 (Tryp.)
 Dumitresco, N., 905 (Lep.)
 Duncan, J. A. A., 343 (Y.F.)
 Dunn, C. L., 63, 146 (Mal.)
 Dupoux, R., with Decourt, Belfort & Henry, 65 (Mal.)
 Duprat, 859 (Hel.)
 Dupuy, 920 (Tryp.)
 Durand, R., with Laigret, 346 (Y.F.)
 —, with — & Bonneau, 687 (Y.F.)
 Durandy, P., with Augier, 481 (Fev.)
 Durieux, C. & Arquié, E., 846 (Fev.)
 —, with Mathis, C. & Mathis, M., 345, 688 (Y.F.)
 —, Rivoalen, A. & Mathis, M., 845 (Fev.)
 Dyer, R. E., 844 (Fev.)
 —, with Lillie, 483 (Fev.)

E.

Eagle, H., 663 (Vms.)

- Earle, W. C., 140, 636 (Mal.)
 — & Howard, H. H., 636 (Mal.)
 — & Perez, M., 161 (Mal.)
 Eckhardt, A. E. & Eckhardt, G., 357 (R.F.)
 Eckstein, F., 629 (Mal.)
 Eddy, B. E., 608 (Lep.)
 Efendiev, M., Adjalov, S., Vinnitski, B.,
 Glashkina, T., Melikova, T., Rakhmanova,
 E., Sadykhov, A. & Tariverdiev, G., 216.
 (Mal.)
 Egypt, 494 (Oph.)
 Egypt, Ministry of the Interior, (711) (Mal.)
 Egypt, Ministry of Public Health, 876 (Hel.)
 Ejercito, A., (159), 371 (Mal.)
 —, Mendiola, J. C. & Baisas, F. E., 580
 (Mal.)
 Elford, W. J. & Galloway, I. A., 232 (Rab.)
 —, with —, 232 (Rab.)
 Elias, S., 50 (Leish.)
 Ellis, M., 439 (Misc.)
 Elmendorf, J. E., Jr. & Smith, H. H., 692
 (Y.F.)
 Elsbach, E. M., 711, 887 (Mal.)
 Emerson, G. A., 318, 914 (Lep.)
 Emmons, C. W. & Carrión, A. L., 175 (Der.)
 Enachesco, S. D., with Stanesco, 817 (Misc.)
 Enault, (336) (Dys.)
 Epstein, E. F., with Moshkovsky, Demina,
 Nossina, Melikhan-Shenina, Basina,
 Pavlova & Wunder, 856 (Fev.)
 Erf, L., with Peck & Rosenthal, 645, 720
 (Vms.)
 Ermakova, N., (311), 607 (Lep.)
 Escamel, E., 508 (Misc.), 733 (Vms.)
 Espié, A., 874 (Hel.)
 Espino, R., with Morales Otero, Perez,
 Ramirez Santos, Ramú, Fuster, González
 & Marrero, 810 (Misc.)
 Esplan, G., with Le Gac & Moustardier, 966
 (Y. & S.)
 Esseveld, H., with Schüffner, 383 (Mal.)
 Ester, F., 640 (Mal.)
 Estrada, A., 45 (Leish.)
 Evans, A. M. & Garnham, P. C. C., 628
 (Mal.)
 — & Symes, C. B., 629 (Mal.)
 Evans, B. D. F., with Wills & Clutterbuck,
 501 (Misc.)
 Evans, J. T. R., 119 (Tryp.)
- F.**
- Fabiani, G., 899 (Oph.)
 Fabre, M., 600 (Lep.)
 Fabry, 206 (Mal.)
 Fabry, A., Guillermin, J. & Ragiot, C., 583
 (Mal.)
 Fairbairn, H., 931 (Tryp.)
 Fairley, N. H., 82 (Sp.), 841 (Bl.)
 — & Bromfield, R. J., 841 (Bl.)
 Fan, P. L., 574 (Leish.)
 Fantham, H. B. & Porter, A., 510 (Misc.)
 Fargea, 860 (Hel.)
 Farinaud, J., 619 (Mal.)
 Farinaud, M. E., 205 (Mal.)
 — & Moreau, P., 205, (210), 778 (Mal.)
 —, with Ramijeau & Huong, 700 (R.F.)
 —, with — & Tran-Van-Tam, 701 (R.F.)
- Faust, E. C., (31), 455 (Hel.)
 —, with Dauer, 147 (Mal.)
 —, with King & Sanders, 858 (Hel.)
 —, with Riley & Cook, (943) (Mal.)
 Fejgin, B., 480, 482, 484 (Fev.)
 Feng, L. C., 34 (Hel.), 377, 942 (Mal.), 503
 (Misc.)
 — & Chung, H.-L., 353, 702 (R.F.)
 —, with — 352 (R.F.)
 Feroselle Bacardi, J. & Portuondo del
 Pino, A., 400 (Hel.)
 Fernández, J. M. M. (909) (Lep.)
 Fernando, A. C., with Cochrane & de Simon,
 (606) (Lep.)
 Fernán-Núñez, M., 225 (Bl.)
 Field, J. W., 615 (Mal.)
 — & Niven, J. C., 615 (Mal.)
 Field, M. E., with Augustine & Drinker, 35
 (Hel.)
 Fielding, J. W., with Murray, 359 (Lept.)
 Fikri, M. M. & Ghalioungui, P., 875 (Hel.)
 Findlay, G. M., 337, 695 (Y.F.)
 — & Davey, T. H., 343 (Y.F.)
 — & MacCallum, F. O., 689, 692 (Y.F.)
 — & Mackenzie, R. D., 347 (Y.F.)
 — & Mahaffy, A. F., 347 (Y.F.)
 Fink, D. E. & Haller, H. L., 264 (Misc.)
 Finkelman, I., 662 (Vms.)
 Finlayson, M. H., 732 bis (Vms.)
 di Fiore, H., with Battaglia, 879 (Hel.)
 Fischer, J. A., 310 (Lep.)
 Fischer, O., 217, 370 (Mal.), (331) (Dys.),
 496 (Misc.)
 Fisk, R. T., with Hoyt, Moore & Tracy, 236
 (Rab.)
 Fitte, O. A., (401) (Hel.)
 Flack, H., Majumder, D. C. & Goldsmith, K.,
 (159) (Mal.)
 Flandin, C., Baranger, P. & Ragu, J., 314
 (Lep.)
 — & Ragu, J., 600 (915) (Lep.)
 Fleury, O., with Launoy, 933 (Tryp.)
 Flori, with Pieri, Bouet & Aubanel, 617
 (Mal.)
 Flye Sainte Marie, P., 578 (Leish.)
 —, with Deschiens, 323 (Dys.)
 Fonseca, R. C., 24 (Hel.)
 Fontoura de Sequeira, L. A., 477 (Fev.)
 Ford, N., 265 (Misc.)
 Forkner, C. E., with Teng, 45 (Leish.)
 Fortin, with Arlo, 850 (Fev.)
 Fortuna, S., (776) (Mal.)
 Foster, A. O., 29 (Hel.)
 Fourche, J. A. & Morlighem, H., 117 (Tryp.)
 Fox, H., 249 (Misc.)
 Foy, H. & Kondi, A., 837, 838 bis (Bl.)
 Fraga, J., (946) (Mal.)
 Francis, E., 361 (R.B.F.)
 Fraser, A. G. L., with Cunningham, 701 (R.F.)
 Fricks, L. D., (411) (Pl.)
 Friedmann, J., 616 (Mal.)
 Frimberger, F., 500 (Misc.)
 Fritz, J., with Sicault, Messerlin & Lummau,
 168 (Mal.)
 Frye, W. W. & Meleney, H. E., 325, 328 (Dys.),
 505 (Misc.)
 —, with —, 325 (Dys.)
 Fukuda, S. & Morikawa, K., 397 (Hel.)

Fuller, M. E., with Mackerras, Austin & Lefroy, 443 (Misc.)
 Fullerton, H. W. & Innes, J. A., 78 (Sp.)
 Fulton, J. D., 592, 781 (Mal.)
 Fuster, J. L., with Morales Otero, Perez, Ramirez Santos, Espino, Ramú, González & Marrero, 810 (Misc.)

G.

- Gaceta Medica de Caracas, (938) (Tryp.)
 Gacoba, C., with Nolasco, 386 (Hel.)
 Galambos, A. & Mittelman, W., 432 (Misc.)
 Galliard, H., 16, 32, (38), 461, 462, 891 (Hel.), (136) (Tryp.), 263, 509 (Misc.)
 —, Autret, M. & Phan-huy-Quat, (16) (Hel.)
 — & Phan-huy-Quat, 866 (Hel.)
 —, — & Dang-van-Ngu (16) (Hel.)
 Galliard, R. & Sicé, A., 893 (Hel.)
 Galloway, I. A. & Elford, W. J., 232 (Rab.)
 —, with —, 232 (Rab.)
 Galvão, A. A. & Lane, J., 683 (Y.F.)
 Ganguli, A. C., with Chowdhury, 684 (Y.F.)
 Ganguli, P. & Bhattacharya, P. B., (152) (Mal.)
 Ganguly, S. K., with Chopra & Roy, 66 (Mal.)
 Ganguly, S. N., 642, 643, 644 (Vms.)
 — & Malkana, M. T., 642 bis (Vms.)
 —, with Taylor & Mallick, 645 (Vms.)
 Garcia, E. Y., with Africa, 451, 469 (Hel.)
 Garnham, P. C. C., with Evans, 628 (Mal.)
 Garniron, R., 669 (B.R.)
 Garvis, B. W., with Kang, 159 (Mal.)
 Gaschen, H., 209 (210), 375 (Mal.)
 — & Marneffe, H., 209, 375 (Mal.)
 —, with —, (210) (Mal.)
 — & Raynal, J., 164 (Mal.)
 Gaube, R., with Brulé & Hillemand, 841 (Bl.)
 Gaubert, with Giraud, 574 (Leish.)
 — with —, Montus & Sardou, 574 (Leish.)
 Gavrilov, W., with Dubois & van Breuseghem, 608 (Lep.)
 Gear, J. H. S. & Bevan, C., 476 (Fev.)
 Gebert, S., 70 (Mal.), 459 (Hel.)
 Genevray, J. & Doderio, J., 672 (Rab.)
 Genka, C., 148 (Mal.)
 Gentile, G., 19 bis (Hel.)
 Gerber, M., 788 (Pl.)
 Gerber, M. R., (210) (Mal.)
 Gerlach, F. & Schweinberg, F., 673 (Rab.)
 Germain, A., Carboni, P. & Morvan, A., 330 (Dys.)
 — & Morvan, A., 582 (Mal.)
 Ghalioungui, P., with Fikri, 875 (Hel.)
 Gharpure, P. V. & Gharpure, V. V., 457 (Hel.)
 Ghose, A. K., 946 (Mal.)
 Ghosh, B. N. & De, S. S., (648) (Vms.)
 Ghosh, L. M., with Maplestone, 182 (Der.)
 Giaquinto Mira, M., 895 (Hel.)
 Gibbins, E. G., 264 (Misc.)
 Giemsa, G. & Nauck, E. G., 496 (Misc.)
 Gilkes, H., 104 bis (Tryp.)
 Gill, D. G., with Smith & McAlpine, 874 (Hel.)
 Gille, R., with Benhamou, 442 bis (Misc.)
 Ginsberg, J. E., with Bernstein, 441 (Misc.)
 Ginsburg, J. M., 941 (Mal.)
 Giordano, M., 246 (Misc.)
 de Giorgi, M., 30 (Hel.), 116 (Tryp.)
 Giovanni, M., 334 (Dys.)
 Giovannola, A., (18), 38, 861 (Hel.)
 Gippet, E., with Berny, 316 (Lep.)
 Girard, G., 408, 789 (Pl.)
 Giraud, P., 567 (Leish.)
 — & Cabassu, H., 575 (Leish.)
 — & Caillol, 41 (Leish.)
 —, Ciaudo, P. & Bernard, R., 46 (Leish.)
 — & Gaubert, 574 (Leish.)
 —, Montus, Sardou & Gaubert, 574 (Leish.)
 Girolami, M., 333 (Dys.)
 Giroud, P., 483, 487, 852 (Fev.)
 di Giuseppe, F., 855 (Fev.)
 Glashkina, T., with Efendiev, Adjalov, Vinnitski, Melikova, Rakhmanova, Sadykhov & Tariverdiev, 216 (Mal.)
 Glowazky, F., 932 (Tryp.)
 Gobert, E., 860 (Hel.)
 Gold, H. & Goodman, W., 487 (Fev.)
 Goldburgh, H. L., 331 (Dys.)
 Gold Coast, 106, 117 (Tryp.)
 Goldsmith, K., with Flack & Majumder, (159) (Mal.)
 Golse, J., 593 (Mal.)
 Gonnert, R. & Westphal, A., 504 (Misc.)
 —, with —, 948 (Am.)
 González, D., with Morales Otero, Perez, Ramirez Santos, Espino, Ramú, Fuster & Marrero, 810 (Misc.)
 González, G., 336 (Dys.)
 González, J. O., with Bachman, 458 (Hel.)
 —, with —, Rodríguez Molina & Hoffman, 872 (Hel.)
 Gonzalez Bosch, R. & Mosto, D., 448 (Hel.)
 Goodall, J., 576 (Leish.)
 Goodman, W., with Gold, 487 (Fev.)
 Gordin, G. A., 954 (Am.)
 Gordon, H., with Konstam, 79 (Sp.)
 Gordon, R. M. & Davey, T. H., 268 (Misc.), 477 (Fev.)
 Gore, R. N., 263 (Misc.)
 Goret, P., with Verge, 230 (Rab.)
 Gori, D., with Buonomini, 939 (Mal.)
 Gorman, J. H., with Molony, 55 (Mal.)
 Gosio, R., 598 (Mal.)
 Gowe, D. F., 930 (Tryp.)
 Gradle, H. S., with Lenzen, 492 (Oph.)
 Graf, H., 358 (Lept.), 544 (Tryp.)
 Graham, H. B., 804 (Hel.)
 Grasset, E., 646 (Vms.)
 — & Zoutendyk, A., 722 bis, 723 (Vms.)
 Graves, B., 901 (Oph.)
 Gregg, A. L., with Cooke & Manson-Bahr, 545 (Tryp.)
 Greppi, E., 387 (Hel.)
 — & Delconardi, S., (331) (Dys.)
 Grewal, R. S., 377 (Mal.)
 Grieco, V., 311 (Lep.)
 —, with Mendes, 609 (Lep.)
 Griffiths, T. H. D. & Hanson, H., 488 (Fev.)
 Grimard, L., with Nattan-Larrier, 43 (Leish.)
 Grossmann, H., (425) (Chl.)
 Grunske, F., 372 (Mal.)
 Grysez, V., 672 (Rab.)
 Guay, A. J. L., with Sterling, 449 (Hel.)
 Guernica, A., with Panisello & Jimenez, 23 (Hel.)

Guiart, J., 787 (Pl.)
 Guibert, 927, 928 (Tryp.)
 Guichard, F., 455 (Hel.)
 Guidetti, C., (378), 775 (Mal.)
 Guillerm, J., with Fabry & Ragiot, 583 (Mal.)
 Guillier, M., 798 (Hel.)
 Gulbrandsen, R., with Browning, 122 (Tryp.)
 Gunawardana, S. A., 869 (Hel.)
 Gunther, C. E. M., 228 (Bl.), 851 (Fev.)
 Guo, K.-D., 934 (Tryp.)
 Gupta, B. M. D., 333 (Dys.)
 Gupta, J. C., with Chopra & Sen, 956 (Am.)
 Gupta, P. N. S., with Maitra, 484 (Fev.)
 Gupta, S. C. S., 233 (Rab.)
 —, with Strickland, 164 (Mal.)

H.

Haagen, E., 695 (Y.F.)
 Hach, with Huard & Boutareau, 954 (Am.)
 Hackett, L. W., 57 (Mal.), 446 (B.R.)
 Hagemann, P., 608 (Lep.)
 —, with Dahr, 81 (Sp.)
 Haguenau, J., Cruveilhier, L. & Viala, C., 678 (Rab.)
 Hakansson, E. G., 332 (Dys.)
 —, with Buckner, J. F. & Down, H. A., 952 (Am.)
 Halder, K. C., with Napier, 576 (Leish.)
 —, with Smith, Lal & Mukerjee, 44 (Leish.)
 —, with —, Mukerjee & Lal, 50 (Leish.)
 Hall, M. C., 878, 880 (Hel.)
 — & Collins, B. J., 880 *bis* (Hel.)
 Haller, H. L., with Fink, 264 (Misc.)
 Hamburger, L. P. & Bernstein, A., 225 (Bl.)
 Hance, J. B., 666 (Vms.)
 Hanes, F. M. & McBryde, A., 74 (Sp.)
 Hanson, H., with Griffiths, 488 (Fev.)
 Hanut, C. J., 655, 666, 667, 725 (Vms.)
 Harbhagwan, with Jaswant Singh, 625 (Mal.)
 Hargis, A. S., 731 (Vms.)
 Harkaway, N., 798 (Hel.)
 Harrison, H., 540 (Tryp.)
 Harrispe, J. V., with Cain, Cattán & van der Boijen, 842 (Bl.)
 de Hartogh, L. F. S., (840) (Bl.)
 Hass, G. M. & Pinkerton, H., 470 (Fev.)
 Hasselmann, C. M., 959 (Y. & S.)
 Hasskó, A., with Scheff, 130 (Tryp.)
 Havemann, R. & Wolff, K., 649 (Vms.)
 Hayashi, N., with Aiso, 251, 252 (Misc.)
 Hazen, H. H., Parran, T., Sanford, A. H., Seneear, F. E., Simpson, W. M. & Vonderlehr, R. A., 312 (Lep.)
 Headlee, W. H., 449 (Hel.)
 Hecht, G., 157 (Mal.)
 —, with Mietzsch & Mauss, 157 (Mal.)
 Hegner, R., 505 *bis* (Misc.)
 Hennessey, R. S. F., 256 (Misc.)
 Henard, C., with Brutsaert, 530 (Tryp.)
 —, with van Hoof & Peel, 925, 926 *bis* (Tryp.)
 Henry, A., (156) (Mal.)
 Henry, C., with Decourt, Dupoux & Belfort, 65 (Mal.)
 —, with — & Marini, (161) (Mal.)
 Henry Lester Institute of Medical Research, 243 (Misc.)
 Herman, C., with Manwell, 219 (Mal.)
 Hermans, E. H. & Schotman, J. W., 248 (Misc.)
 Herms, W. B. & Wheeler, C. M., 356 (R.F.)
 Hernández Gomez, J. G., 223 (Bl.)
 Hernberg, C. A., 400 (Hel.)
 Herrada Llibre, M., with Arenas Martorell, 231 (Rab.)
 Hess, E., with Wagner, 512 *bis* (Misc.)
 van Heukelom, A. S. & Overbeek, J. G., 158 (Mal.)
 Heydon, G. A. M., 458 (Hel.)
 Heymons, R. & Vitzthum, H. G., 445 (Misc.)
 Hicks, E. P. & Diwan Chand, 443 (Misc.)
 — & Majid, S. A., 615 (Mal.)
 Higgins, L. & Thorne, R. T., 664 (Vms.)
 Hillemand, P., with Brulé & Gaube, 841 (Bl.)
 Hingst, H. E., 587 (Mal.)
 Hinman, E. H., 167 (Mal.), 478 (Fev.), 877 (Hel.)
 —, with Kampmeier, 953 (Am.)
 Hoang-Tich-Try, with Raynal & Vaucel, (210) (Mal.)
 —, with Vaucel, 233 (Rab.), 591 (Mal.)
 Hoare, C. A., 524 (Tryp.)
 — & Bennett, S. C. J., 531 (Tryp.)
 —, with Brown & Brown, 511 (Misc.)
 Hodgkin, E. P. & Johnston, R. S., 376 (Mal.)
 —, with Lewthwaite & Savoor, 472 (Fev.)
 Hoeppli, R., (269) (Misc.)
 Hoffman, W. A., with Bachman, Rodríguez Molna & González, 872 (Hel.)
 —, with Rodríguez-Molina, 803 (Hel.)
 Hoffmann, E., 968 (Y. & S.)
 Hoffmann, W. H., 693 (Y.F.)
 Holden, H. F., (648) (Vms.)
 — & Setter, C. G., (648) (Vms.)
 Holsendorf, B. E., (415) (Pl.)
 Home Office, 357 (Lept.)
 Hong Kong, 368 (Mal.)
 van Hoof, J., 523 (Tryp.)
 —, Henard, C. & Peel, E., 925, 926 *bis* (Tryp.)
 van Hoof, M. T., with Rodhain, 515 (Misc.)
 Hora, S. L., with Prashad, 382 (Mal.)
 Horgan, E. S. & McKinnon, R. M., 674 (Rab.)
 Hornby, H. E., 524 (Tryp.)
 Horrenberger, R., 703 (R.F.)
 Howard, H. H., with Earle, 636 (Mal.)
 Howles, J. K., 180 (Der.)
 Hoyt, A., Fisk, R. T., Moore, F. J. & Tracy, R. L., 236 (Rab.)
 Hsu, H. F. & Chow, C. Y., 802 (Hel.)
 — & Khaw, O. K., 395 (Hel.)
 Hu, C. H., 42 (Leish.)
 Hu, S. M. K., with Baisas, 635 (Mal.)
 — & Yu, H., 165 (Mal.)
 Huang, T. F., with Su, 940 (Mal.)
 Huard, P., Boutareau & Hach, 954 (Am.)
 Hudson, E. H., 965 (Y. & S.)
 Huff, C. G. & Bloom W., 621 (Mal.)
 Hughes, T. P., with Lynch, 348, 693 (Y.F.)
 Huizenga, L. S., 307 (Lep.)
 Huong, N. V., with Ramijean & Farinaud, 700 (R.F.)
 Huston, J., 955 (Am.)
 Hyatt, J. W. & Buckland, F. E., 664 (Vms.)
 Hynes, M. & Martin, L. C., 254 (Misc.)

I.

- Idelsohn, F., with Mazza & Parcerisa, (562) (Tryp.)
Ikeda, K., 814 (Misc.)
Ilvento, A., with Lutrario & Mazzitelli, 25 (Hel.)
Innes, J. A., with Fullerton, 78 (Sp.)
Iolkin, with Batunin, 180 (Der.)
Iriarte, D. R., 561 (Tryp.)
Ishibashi, T., 609 (Lep.)
Ishioka, H., 947 (Mal.)
Itakurai, T., (309) (Lep.)
Ivanić, M., 324 (Dys.), 510, 515 (Misc.)
Iyengar, M. O. T., 884 (Hel.)
Iyer, M. A. K., 361 (R.B.F.)

J.

- Jackson, C. H. N., 539 (Tryp.)
Jackson, F. W. F., 106 (Tryp.)
Jackson, R. B., 140, 368 (Mal.), 459 (Hel.)
Jacono, I., with Castellani, (861) (Hel.), (928) (Tryp.)
Jacotot, H., (210) (Mal.)
Jadin, J., 428 (Chl.), 692 (Y.F.)
Jahn, T. L., 506 (Misc.)
Jakeman, H. W., 677 (Rab.)
Jakoubovitch, S. A., with Konus, 870 (Hel.)
Jamaica, 959 *bis* (Y. & S.)
James, S. P., 337, 339 (Y.F.)
— & Tate, P., 589 (Mal.)
Janbon, M., with Rimbaud & Labraque-Bordenave, 705 *bis* (Lept.)
von Jancsó, N. & von Jancsó, H., 129 (Tryp.)
Janssens, P. G., 127 (Tryp.)
Janzi, E. Z., with Mazza, Montaña & Benítez, 563 (Tryp.)
Jarvis, B. W., with Wong & Kang, 581 (Mal.)
Jaswant Singh & Harbhagwan, 625 (Mal.)
Jauffret, R., 677 (Rab.)
Jaulmes, C., with Binet & Weller, 644 (Vms.)
Jensen, G., 415 (Pl.)
Jerace, F., 617 (Mal.)
de Jesus, P. I., 221 (Mal.)
Jimenez, J. A., with Panisello & Guernica, 23 (Hel.)
Jitta, N. M. J., 25 (Hel.)
Jobling, B., 503 (Misc.)
Johansen, F. A., 909 (Lep.)
Johnson, C. M. & Kelser, R. A., 937 (Tryp.)
Johnston, R. S., with Hodgkin, 376 (Mal.)
Johnston, T. H., 37 (Hel.)
Jolly, A., 29 (Hel.)
— & Sicault, 621 (Mal.)
Jolly, A. M. D., 153 (Mal.)
—, with Marchoux, 588 (Mal.)
Joltrain, E., 406 (Pl.)
Jones, E. R., 116 (Tryp.)
Jonnescio, D., 232 (Rab.)
Jordan, E. O. & Burrows, W., 815 (Misc.)
Jordan, J., 944 (Mal.)
Jordan, J. W. & Weidman, F. D., 177 (Der.)
Joslyn, H. L., 334 (Dys.)
Jospin, M., with Robin, 927, 928 (Tryp.)
Jospin, Y., 893 (Hel.)
Joyeux, C., (38) (Hel.), 818 (B.R.)
Junier, R., 306 (Lep.)
Jurukoff, B., 499 (Misc.)

K.

- Kaiser, P. J., with Kuilman & Sardjito, 813 (Misc.)
Kambayashi, T. & Ando, K., 177 (Der.)
Kaminstein, I., with Sulzberger, 181 (Der.)
Kampmeier, R. H. & Cameron, P. B., 502 (Misc.)
— & Hinman, E. H., 953 (Am.)
Kan, H., (394) (Hel.)
— & Kung, J., 395 (Hel.)
Kanai, T., 953 (Am.)
Kanazawa, K., 671 *bis* (Rab.)
Kang, T. & Garvis, B. W., 159 (Mal.)
—, with Wong & Jarvis, 581 (Mal.)
Kariadi, 886 (Hel.)
Kassis, I., with Turner & Dennis, 21 (Hel.)
Kau, I. S., 390 (Hel.)
— & Wu, K., 17 (Hel.)
Kaufmann, W., 797 (Hel.)
Kawai, T., 868 (Hel.)
— & Yumoto, Y., 16 (Hel.)
Kawana, H., 15 (Hel.)
—, with Komiya, 16 (Hel.)
Kedrowsky, W. J., (608) (Lep.)
Keil, E., 33 (Hel.)
Kellaway, C. II & LeMessurier, D. H., 649, 734 (Vms.)
Keller, A. E., with Leathers, 795 (Hel.)
—, with — & Wyman, 25, 453 (Hel.)
Kelser, R. A., 137 (Tryp.)
—, with Johnson, 937 (Tryp.)
Kemp, H. A., 479 (Fev.)
Kenawy, M. R., 864 (Hel.)
Kennedy, W. P. & Mackay, I., 259 (Misc.)
Kenya Colony & Protectorate, 244 (Misc.)
Kernkamp, Y., with Occhino, 611 (Lep.)
Kessel, J. F., Blakely, L. & Cavell, K., 320 (Dys.)
Kevorkoff, N. P., with Khodukin & Sofieff, 570 (Leish.)
Khalek, K. A., 25 (Hel.)
Khalil, M., 460, 876 (Hel.)
Khaw, O. K., with Hsu, 395 (Hel.)
Khodukin, N. J., Sofieff, M. S. & Kevorkoff, N. P., 570 (Leish.)
Kiewe, P., 491 (Oph.)
King, E. F., 493 (Oph.)
King, E. L., Faust, E. C. & Sanders, J. T., 858 (Hel.)
Kingsbury, A. N., 441 (Misc.)
Kiribayashi, S. & Aida, T., 783 (Chl.)
Kirk, J. B., 73 (Sp.), 897 (B.R.)
Kirk, R., 339 (Y.F.)
Kirschen, N., 660, 661 (Vms.)
Kitchen, S. F., with Boyd, 72, 715, 716 (Mal.)
—, with — & Muench, 587 *bis* (Mal.)
—, with — & Stratman-Thomas, 173 (Mal.)
— & Bradley, G. H., 636 (Mal.)
Kligler, I. J. & Comaroff, R., 476 (Fev.)
— & Mer, G., (164) (Mal.)
— & Olitzki, L., 132 (Tryp.)
von Klobusitzky, D., 650, 663 (Vms.)
— & König, 651 *bis*, 653 *bis*, 654 (Vms.)
Knauff, G., 335 (Dys.)
Kneebone, J. Le M., 804 (Hel.)
Knott, J., 799 (Hel.)
Knowles, R. & Das Gupta, B. M., 508 (Misc.)

Koba, K., 397 (Hel.)
 Kofoid, C. A., 135 (Tryp.)
 — & Whitaker, B. G., 136 (Tryp.)
 — & Williams, O. L., 37 (Hel.)
 Koh, T. M., with Rose, 864 (Hel.)
 Kohls, G. M., 854 (Fev.)
 Kohlshütter, E. & Minning, W., 719 (Vms.)
 Koller, M., 948 (Am.)
 Komiya, Y., 15 (Hel.)
 — & Kawana, H., 16 (Hel.)
 Komp, W. H. W., (684) (Y.F.)
 —, with Clark, 620 (Mal.)
 Kondi, A., with Foy, 837, 838 *bis* (Bl.)
 König, P., with v. Klobusitzky, 651 *bis*, 653 *bis*, 654 (Vms.)
 Konstam, G., 79 (Sp.)
 — & Gordon, H., 79 (Sp.)
 Konus, E. M. & Jakoubovitch, S. A., 870 (Hel.)
 Kopaczewski, W., 573 (Leish.)
 Kopciowska, L., with Nicolau, 231 (Rab.)
 Korobkova, E., 413 (Pl.)
 Kotikas, A., (585) (Mal.)
 Koulaguine, S. & Marzinovski, V., 173 (Mal.)
 Kouri, P., with Bolaños & Anido, 385 (Hel.)
 —, with Calvo Fonseca & Basnuevo, 385 (Hel.)
 Kraan, M. H., with Swellengrebel, de Buck & Schoute, 143 (Mal.)
 —, with —, — & van der Torren, 69 (Mal.)
 Krasnjanskij, M. W. & Lawrow, A. P., 50 (Leish.)
 Kreis, H. A., 883 (Hel.)
 Krishnan, K. V., Pai, N. G. & Bose, P. N., 573 (Leish.)
 Kröber, F., 454 (Hel.)
 Kroemer, G., 177 (Der.)
 Kroö, H., 133 (Tryp.)
 Kuilman, J., Kaiser, P. J. & Sardjito, M., 813 (Misc.)
 Kunert, H., 552 (Tryp.)
 —, with Schilling, Schreck & Neumann, 125, 554 (Tryp.)
 Kung, J., with Kan, 395 (Hel.)
 Kuypers, C. A., 248 (Misc.)

L.

Labraque-Bordenave, with Rimbaud & Janbon, 705 *bis* (Lept.)
 LaFace, L., 363 (B.R.)
 Lagoudaky, S., 613 (Lept.)
 Lahiri, B. N., with Covell, McGuire & Stephens, 236 (Rab.)
 Laigret, J., 346 (Y.F.)
 — & Durand, R., 346 (Y.F.)
 —, — & Bonneau, E., 687 (Y.F.)
 —, Saleun, G. & Ceccaldi, J., 688 (Y.F.)
 —, with Sellards, 688 (Y.F.)
 Lal, C., with Smith, Mukerjee & Halder, 44, 50 (Leish.)
 Lal, R. B., with White, Adhikari & Swaroop, 380 (Mal.)
 Lamborn, W. A., 522 (Tryp.), 610 (Lept.), 964 (Y. & S.)
 Lampe, P. H. J., 309 (Lept.)
 — & de Moore, C. E., 310 (Lept.)
 —, — & van Veen, A. G., 317 (Lept.)

Lamprell, B. A., 162 (Mal.)
 Lancet, 589 (Mal.)
 Landazuri, O., with Ruiz, 846 (Fev.)
 Landeiro, F. & Cambournac, F., 144 (Mal.)
 Lane, C., 456, 885, 888 (Hel.)
 Lane, J., with Galvão, 683 (Y.F.)
 Langeron, M. & Baeza, M., 178 (Der.)
 Lapage, G., 739 (B.R.), 871 (Hel.)
 Lappine, G., with Danilova, 172 (Mal.)
 Lara, C. B., 307 (Lept.)
 Latishev, N. J., with Moshkovsky & Nossina, 856 (Fev.)
 Latychev, N., 266 (Misc.)
 Launoy, L., 557, 929, 934 (Tryp.)
 — & Fleury, O., 933 (Tryp.)
 —, Prieur, M. & Ancelot, A., 128 (Tryp.)
 Laurent, P., with Stefanopoulou & Wassermann, 346 (Y.F.)
 de Lavergne, V. & Accoyer, H., 709 (Lept.)
 Lavrinenko, M., with Ciuca, Ballif & Chelarescu, 156 (Mal.)
 Lawoetz, B. & Vogt-Møller, P., 80 (Sp.)
 Lawrow, A. P. & Dubowskoj, P. A., 578 (Leish.)
 —, with Krasnjanskij, 50 (Leish.)
 Lazar, C., with Mezincesco, Cornelson & Buşilă 159 (Mal.)
 League of Nations. Health Organisation, 873 (Hel.)
 League of Nations. Health Organisation. Eastern Bureau, Singapore, 783 (Chl.)
 Leathers, W. S. & Keller, A. E., 795 (Hel.)
 —, — & Wyman, B. F., 25, 453 (Hel.)
 Le Chuiton, 470 (Fev.)
 —, Berge, C. & Pennanéac'h, J., 479 (Fev.)
 Lee, C. U., with Wang, 61 (Mal.)
 Lefrou, G. & Des Essarts, J. Q., 308 (Lept.)
 —, with —, 310, 914 (Lept.)
 Lefroy, E. H. B., with Mackerras, Fuller & Austin, 443 (Misc.)
 Lega, G. & Casini, G., 593 (Mal.)
 Le Gac, P., 731 (Vms.)
 — & Albrand, L., 857 (Fev.)
 —, Esplan, G. & Moustardier, G., 966 (Y. & S.)
 Legendre, F., 912 (Lept.)
 Leger, M., with Mesnil & Pérard, 126 (Tryp.)
 Leimena, J. M. & Sardjito, M., 433 (Misc.)
 Leiper, R. T., 399 (Hel.)
 LeMessurier, D. H., with Kellaway, 649, 734 (Vms.)
 Le Minor, L., with Berny, 779 (Mal.)
 Le Nestour, 208 *bis* (Mal.)
 Lenskaya, G., with Bessonova, Molodtsova & Mossolova, 414 (Pl.)
 Lenzen, A. F. & Gradle, H. S., 492 (Oph.)
 Lépine, P. & Sautter, V., 231 (Rab.)
 Leprosy Review, 301, 602, 603, 916 (Lept.)
 Lesné, E., Troisier, J. & Bénard, H., 708 (Lept.)
 Lester, H. M. O., 520 (Tryp.)
 Lestoquard, F. & Donatien, A., 45 (Leish.)
 —, with Donatien, 575 (Leish.)
 Levaditi, C. & Schoen, R., 233 (Rab.)
 —, — & Reinié, L., 678 *bis* (Rab.)
 Le Van Phung, with Montel, R. & Montel, G., 611 (Lept.)
 Lewis, B. S., 481 (Fev.)
 Lewis, E. G., with Bozman, 419 (Chl.)

- Lewthwaite, R., Hodgkin, E. P. & Savor, S. R., 472 (Fev.)
 — & Savor, S. R., 473, 474 (Fev.)
 Li, S. Y., with Campbell & Webster, 18 (Hel.)
 Lie, H. P., 309 (Lep.)
 Lièvre, H., with Senevet & Witas, 805 (Hel.)
 Lillie, R. D. & Dyer, R. E., 483 (Fev.)
 Lima, E. Q., with Torres, 230 *bis*, 676 (Rab.)
 Lima, J. de A., 376 (Mal.)
 Lima, M. de S., 910 (Lep.)
 Limine, M., 509 (Misc.)
 Lindberg, K., 35 (Hel.)
 Lindgren, C. C., with McKnight, 607 (Lep.)
 Ling, C. Y., with Chu, Liu & Zee, (386) (Hel.)
 Ling, L. C., Liu, K. B. & Yao, Y. T., 378 (Mal.)
 — & Yao, Y. T., 795 (Hel.)
 —, with Yao & Liu, 152 (Mal.)
 Link, T., 656 (Vms.)
 Linton, R. W. & Mitra, B. N., 422 (Chl.)
 —, — & Mullick, D. N., 422 (Chl.)
 —, — & Seal, S. C., 425 *bis* (Chl.)
 Liu, B. C., with Chu, Ling & Zee, (386) (Hel.)
 Liu, H.-L., 401 (Hel.), 955 (Am.)
 Liu, K. B., with Ling & Yao, 378 (Mal.)
 —, with Yao & Ling, 152 (Mal.)
 Livschitz, I. M., with Moshkovsky, Demina, Nossima, Pavlova & Wunder, 856 (Fev.)
 Lloyd, L., 109 (Tryp.)
 Lobos, M. M., with Mazza, (938) (Tryp.)
 Lochow, M. G., with Donskow, 414 (Pl.)
 Loewenthal, L. J. A., 482 (Fev.)
 Longo, P. W., with Campos, 604 (Lep.)
 Lopes, C. F., 963 (Y. & S.)
 Lopresti, A., with Mariani, 386 (Hel.)
 Lorando, N., 488 (Fev.), 574 (Leish.)
 — & Sotiriades, D., 63 (Mal.)
 Loretti, G., with Bacigalupo, 454 (Hel.)
 Lörincz, F. & Makara, G., 265 (Misc.)
 —, Szappanos & Makara, G., 265 (Misc.)
 Lottgering, A. B., with Beins, 77 (Sp.)
 Lourie, E. M., 621 (Mal.)
 — & O'Connor, R. J., 123, 555, 922 (Tryp.)
 Lovett-Campbell, A. C. & Rose, A. W., 393 (Hel.)
 Lowe, J., 305, 600 903 *bis*, 906 (Lep.)
 — & De, N. K., 915 (Lep.)
 —, with Wade, 908 (Lep.)
 Lüders, H., 888 (Hel.)
 Ludwig, H., 80 (Sp.)
 Lumley, G. F., 703 (Lept.)
 Lummau, J., with Sicault, Messerlin & Fritz, 168 (Mal.)
 Lupu, N. G., with Danielopolu, Craciun & Petresco, 483 (Fev.)
 Lutrario, A., Ilvento, A. & Mazzitelli, M., 25 (Hel.)
 Lutz, A., 305 (Lep.)
 Lynch, C. J. & Hughes, T. P., 348, 693 (Y. F.)
- M.**
- McAlpine, J. G., with Baker & Dowling, 231 (Rab.)
 —, with Smith & Gill, 874 (Hel.)
 McBryde, A., with Hanes, 74 (Sp.)
 MacCallum, F. O., with Findlay, 689, 692 (Y.F.)
 Macchiavello, A., with Zinsser, 485, 486 (Fev.)
 Maccolini, R., with Rosa, 160 (Mal.)
 —, with — & Valli, 216 (Mal.)
 MacDonald, G., with Ramsay, 378 (Mal.)
 McDonald, W. M., 715 (Mal.)
 Macfie, J. W. S., 435 (Misc.)
 McGuire, J. P., with Covell, Stephens & Lahiri, 236 (Rab.)
 Machattie, C., with Mills & Chadwick, 387 (Hel.)
 MacKay, E. M. & Schroeder, C. R., 232 (Rab.)
 Mackay, I., with Kennedy, 259 (Misc.)
 McKendrick, A. G., 676 (Rab.)
 Mackenzie, R. D., with Findlay, 347 (Y.F.)
 Mackerras, I. M., Fuller, M. E., Austin, K. M. & Lefroy, E. H. B., 443 (Misc.)
 Mackinnon, J. E., 175 (Der.)
 — & Rodriguez-Garcia, J. A., 180 (Der.)
 McKinnon, R. M., with Horgan, 674 (Rab.)
 McKnight, R. S. & Lindegren, C. C., 607 (Lep.)
 McLester, J. B., with Spies & Chinn, 434 (Misc.)
 McMahan, J. P., with Symes, 541 (Tryp.)
 McMullen, W. H., 901 (Oph.)
 McNaught, J. B. & Anderson, E. V., 458 (Hel.)
 Madwar, S., 374 (Mal.)
 de Magalhães, O., with Moreira, 844 (Fev.)
 Magath, T. B., 401 (Hel.)
 Mageed, A. A. A. (152) (Mal.)
 Mahaffy, A. F., with Findlay, 347 (Y.F.)
 Maier, C., 882 (Hel.)
 Mail, G. A., 638 (Mal.)
 Mainzer, F., 394 *bis* (Hel.)
 — & Yaloussis, E., 394 (Hel.)
 Maitra, G. C. & Gupta, P. N. S., 484 (Fev.)
 Maitra, N. M., with Pandit & Datta Roy, 427 (Chl.)
 Majid, S. A., with Hicks, 615 (Mal.)
 —, with Mulligan, 383 (Mal.)
 Majumdar, A. R., (335) (Dys.)
 Majumder, D. C., with Flack & Goldsmith, (159) (Mal.)
 Makara, G., with Lörincz, 265 (Misc.)
 —, with — & Szappanos, 265 (Misc.)
 Malamos, B., 573 (Leish.)
 —, with Mayer, 40, 43 (Leish.)
 —, with Nauck, 220 (Mal.)
 Maldonado, 248 (Misc.)
 Maldonado Sampedro, M., 592 (Mal.)
 Malkana, M. T., with Ganguly, 642 *bis* (Vms.)
 Mallardo, C. A. & Cotrufo, P., 583 (Mal.)
 Mallick, S. M. K., 723 (Vms.)
 —, with Taylor, 645 (Vms.)
 —, with — & Ganguly, 645 (Vms.)
 Mamou, with Bonan, 571 (Leish.)
 Manalang, J., 913 *ter* (Lep.)
 Mandekos, A., with Barber & Rice, 139, 144, 170, 939 (Mal.)
 Mandlik, G. S., 813 (Misc.)
 Mangiacapra, A., 619 (Mal.)
 Manninger, R. & Marcis, A., 673 (Rab.)
 Manohar, K. D., 333 (Dys.)
 Manouélian, Y., 233, 675 *ter* (Rab.)
 Manson, D., 148 (Mal.)
 Manson-Bahr, P. H., with Cooke & Gregg, 545 (Tryp.)
 — & Muggleton, W. J., 585 (Mal.)

- Mansour, H., with Archibald, 567 (Leish.)
 Manteufel, P., 694 (Y.F.).
 Manwell, R. D. & Herman, C., 219 (Mal.)
 Maplestone, P. A., 805 (Hel.)
 — & Bhaduri, V. N., 38 (Hel.)
 —, with Dey, 178, 179 (Der.)
 — & Ghosh, L. M., 182 (Der.)
 Marchat, J. & Couzi, G., 861 (Hel.)
 Marchoux, E., 905 (I.ep.)
 — & Chorine, V., 309 (Lep.)
 — & Jolly, A. M. D., 588 (Mal.)
 Marcis, A., with Manninger, 673 (Rab.)
 Marczewski, S., 442 (Misc.)
 Margolit, D., 373 (Mal.)
 Mariani, G. & Besta, B., 266 (Misc.), (589) (Mal.)
 — & Lopresti, A., 386 (Hel.)
 — & Taddia, L., 584 (Mal.)
 Marini, C., with Decourt & Henry, (161) (Mal.)
 —, with Villain & Belfort, 47 (Leish.)
 Markianos, J., 48 (Leish.)
 Marneffe, H. & Gaschen, H., (210) (Mal.)
 —, with —, 209, 375 (Mal.)
 Marrero, M., with Morales Otero, Perez, Ramirez Santos, Espino, Ramú, Fuster & González, 810 (Misc.)
 Marteau, P., with Millischer, 237 (Rab.)
 Martilotti, F., 573 (Leish.)
 Martin, D. S., Baker, R. D. & Conant, N. F., 176 (Der.)
 Martin, I. C., with Hynes, 254 (Misc.)
 Martindale, 365 (B.R.)
 Martins, A. V., 799 (Hel.)
 —, with Dias, 844 (Fev.)
 —, with — & Ribeiro, 845 (Fev.)
 Marzinovski, V., with Koulaguine, 173 (Mal.)
 Masayama, S., with Okamoto, (484) (Fev.)
 Mascaró Garcia, D. F., 780 (Mal.)
 Maselli, D., 775 (Mal.)
 Mason, N., 709 (Lep.)
 Massa, F. & de Vivo, A., 855 (Fev.)
 Mathis, C., Durieux, C. & Mathis, M., 345, 688 (Y.F.)
 Mathis, M., 345, 348 (Y.F.)
 —, with Durieux & Rivoalen, 845 (Fev.)
 —, with Mathis, C. & Durieux, 345, 688 (Y.F.)
 Matoff, K., (31) (Hel.)
 — & Wapzarowa, M., 883 (Hel.)
 Matsunobu, M., 717 (Mal.)
 Maurice, H., with Sokhey, 790 (Pl.)
 Mauritius, 73 (Sp.)
 Maury, F. H., 492 (Oph.)
 Mauss, H., with Mietzsch & Hecht, 157 (Mal.)
 Maxwell, J. L., 362 (B.R.), 903 (Lep.)
 May, R. M., 172 (Mal.)
 Mayer, M. & Malamos, B., 40, 43 (Leish.)
 Mazza, S., 135 *bis*, (937) (Tryp.)
 — & Benítez, C., 562, 564 (Tryp.)
 —, — & Benítez, J., (565) (Tryp.)
 — & Castro Rendón, E., (562) (Tryp.)
 —, Cossio, R. & Zuccardi, E., 936 (Tryp.)
 —, Idelsohn, F. & Parcerisa, P. J., (562) (Tryp.)
 — & Lobos, M. M., (938) (Tryp.)
 —, Montaña, A., Benítez, C. & Janzi, E. Z., 563 (Tryp.)
 — & Olle, R., 564 (Tryp.)
 Mazza, S., Romaña, C. & Parma, B., (565) (Tryp.)
 —, — & Zambra, E. R., (565) (Tryp.)
 — & Sanchez, O. B., (938) (Tryp.)
 Mazzitelli, M., 27 (Hel.)
 — with Lutrario & Ilvento, 25 (Hel.)
 Meagher, J. I., 253 (Misc.)
 Medulla, C., (604) (Lep.)
 Mehta, D. R., with Covell, 472 (Fev.)
 de Meillon, B., 58, 70, 154 (Mal.)
 Meira, J. A., (74) (Sp.)
 Mejia, H., 337 (Y.F.)
 Mekhanikova, V., with Schourenkova, 141 (Mal.)
 Meleney, H. E., 579 (Mal.)
 — & Frye, W. W., 325 (Dys.)
 —, with —, 325, 328 (Dys.), 505 (Misc.)
 Melikhan-Shenina, M. L., with Moshkovsky, Demina, Nossina, Epstein, Basina, Pavlova & Wunder, 856 (Fev.)
 Melikova, T., with Efendiev, Adjalov, Vinnitski, Glashkina, Rakhmanova, Sadykhov & Tarverdiev, 216 (Mal.)
 Mellanby, H., 559 (Tryp.)
 — & Mellanby, K., 924 (Tryp.)
 Mellanby, K., 110, 558, 560 (Tryp.)
 de Mello, F., 257 (Misc.)
 de Mello, I. F., 313 *bis* (Lep.)
 — & Pereira, O. I., 302 (Lep.)
 Ménager, J., with Cordier, 673 (Rab.)
 Mendes, E. & Grieco, V., 609 (Lep.)
 Mendiola, J. C., with Ejercito & Haisas, 580 (Mal.)
 Mennonna, G., 374 (Mal.)
 Menon, K. P. & Seetharama Iyer, P. V., 34 (Ilel.)
 Mer, G., 632 (Mal.)
 —, with Kligler, (164) (Mal.)
 Merchante, F. R., 647 (Vms.)
 Mercier, H. & Soulage, 554 (Tryp.)
 Mercier, P., with Darré, Mollaret & Tanguy, 546 (Tryp.)
 Mercken, G., 611 (Lep.)
 Merrett, W. E. S., (349) (Y.F.)
 Merritt, H. H. & Rosenbaum, M., 32 (Hel.)
 Mesnil, F., Leger, M. & Pérard, C., 126 (Tryp.)
 Messerlin, A., with Sicault, 64, 381, 714 (Mal.)
 — with —, Lummau & Fritz, 168 (Mal.)
 Meyer, K. F., 404 (Pl.)
 Meyer, R., (153) (Mal.)
 Meyers, F. M., 454 (Hel.)
 Mezincesco, D. & Cornelson, D. A., with Lazar, C. & Buşilă, L., 159 (Mal.)
 Mietzsch, F., Mauss, H. & Hecht, G., 157 (Mal.)
 Migone, L., with Sigon, 486 (Fev.)
 Mihail, A. C., 492 (Oph.)
 Miller, D. K. & Rhoads, C. P., 83 (Sp.)
 Miller, E. L., (18) (Hel.)
 Miller, J. R., 513 (Misc.)
 Millischer P. & Marteau, P., 237 (Rab.)
 — & Millischer, A., 231 (Rab.)
 Millous, 549 (Tryp.)
 Mills, C. A., 303 (Lep.)
 Mills, E. A., Machattie, C. & Chadwick, C. R., 387 (Hel.)
 Minchin, R. L. H., 807 (Hel.)
 Minning, W., with Kohlshütter, 719 (Vms.)
 Min Sein, 840 (Bl.)
 Mira, M. G., 211 (Mal.)

- Mishnaevsky, M. N., 738 (B.R.)
 Missiroli, A., 630 (Mal.)
 —, with Ascoli, Bonfigli, Casu, Diliberto, Musumeci, Riolo, Rocca & Terenzio, 618 (Mal.)
 Mitchell, J. P., 741 (B.R.)
 Mitin, S. V., (414) (Pl.)
 Mitra, B. N., 426, 427 (Chl.)
 —, with Linton, 422 (Chl.)
 —, with — & Mullick, 422 (Chl.)
 —, with — & Seal, 425 *bis* (Chl.)
 Mitsuda, K., 607 (Lep.)
 — & Ogawa, M., 606 (Lep.)
 Mittelman, W., with Galambos, 432 (Misc.)
 Miyahara, H., 150, 151 (Mal.)
 — & Ogura, M., 586 (Mal.)
 Mochkovski, C., 42 (Leish.)
 Mochtar, A., with Sardjito, 911 (Lep.)
 Modinos, P. & Vassiliadis, P., 846 (Fev.)
 Modugno, G., 699 (R.F.)
 Mogensen, E., 77 (Sp.)
 Moggridge, J. Y., 112, 113 (Tryp.)
 Mohan, B. N., with Rice, 379 (Mal.)
 Mollaret, P., with Darré, Tanguy & Mercier, 546 (Tryp.)
 Molodtsova, P., with Bessonova, Lenskaya & Mossolova, 414 (Pl.)
 Molony, J. B. de W. & Gorman, J. H., 55 (Mal.)
 Monacelli, M., 49 (Leish.)
 Montaña, A., with Mazza, Benítez & Janzi, 563 (Tryp.)
 Montel, E., with Barraux & Bordes, 345 (Y.F.)
 Montel, G., with Montel, R. & Le Van Phung, 611 (Lep.)
 —, with — & Nguyen Ngoc Nhuan, 611 (Lep.)
 Montel, M. L. R., & Bablet, J., 908 (Lep.)
 Montel, R. & Montel, G., 316 (Lep.)
 —, — & Nguyen Ngoc Nhuan, 611 (Lep.)
 — & Truong van Quê, 585 (Mal.)
 Montezin, G., with Bovet, 556 (Tryp.)
 Montglond, with Talec, 315 (Lep.)
 Montus, with Giraud, Sardou & Gaubert, 574 (Leish.)
 de Moor, C. E., with Lampe, 310 (Lep.)
 —, with — & van Veen, 317 (Lep.)
 Moore, F. J., with Hoyt, Fisk & Tracy, 236 (Rab.)
 Moore, M., 499 (Misc.)
 Moore, R., 415 (Pl.)
 Moorthy, V. N., 869, 893 (Hel.)
 — & Sweet, W. C., 35, 464, 465, 466 (Hel.)
 Morales Otero, P., Perez, M. A., Ramirez Santos, R., Espino, R., Ramú, A., Fuster, J. L., González, D., & Marrero, M., 810 (Misc.)
 — & Pomales Lebrón, A., 463, 889 (Hel.)
 Morales Villazón, N., with Uriarte, 413, 417 (Pl.)
 —, with — & Anchezar, 410 (Pl.)
 —, with —, Crescentino & Anchezar, 409 (Pl.)
 Moreau, P., 207, 209 (Mal.), 229 (Bl.)
 —, with Farinaud, 205, (210), 778 (Mal.)
 —, with Ragiot, 64, 65, 777 (Mal.)
 Morehouse, N. F., with Becker, 514 (Misc.)
 Moreira, J. A. & de Magalhães, O., 844 (Fev.)
 Morenas, L., 335 (Dys.)
 — & Brun, J., 583, 584 (Mal.)
 — & Roman, E., 928 (Tryp.)
 Morgan, M. T., 25 (Hel.)
 Morikawa, K., with Fukuda, 397 (Hel.)
 Morishita, K., 164, (164) (Mal.)
 Morledge, W., 951 (Am.)
 Morlighem, H., with Fourche, 117 (Tryp.)
 Morozova, L. I., with Ovtchinikov & Tischenko, 639 (Mal.)
 Morrison, R. J. G., 696 (R.F.)
 Morvan, A., with Germain, 582 (Mal.)
 —, with — & Carboni, 330 (Dys.)
 Moschkovski, S., 214 (Mal.)
 Moser, J. R., with Salle, 910 (Lep.)
 Moshkovsky, S. D., 856 (Fev.)
 —, Demina, N. A., Nossina, V. D., Epstein, E. F., Melikhan-Shenina, M. L., Basina, B. S., Pavlova, E. A. & Wunder, M. A., 856 (Fev.)
 —, —, —, Pavlova, E. A., Livschitz, I. M. & Wunder, M. A., 856 (Fev.)
 —, — & Pavlova, E. A., 856 (Fev.)
 —, Nossina, V. D. & Latishev, N. J., 856 (Fev.)
 —, Russinkovskaia, E. B., Demina, N. A. & Pavlova, E. A., 856 (Fev.)
 Mosna, E., 626 (Mal.)
 Mossolova, O., with Bessonova, Lenskaya & Molodtsova, 414 (Pl.)
 Mosto, D., with Gonzalez Bosch, 448 (Hel.)
 Monles, E., with van Breuseghem, 608 (Lep.)
 Moustardier, G., with Le Gac & Esplan, 966 (Y. & S.)
 Muench, H., with Boyd & Kitchen, 587 *bis* (Mal.)
 Muggleton, W. J., with Manson-Bahr, 585 (Mal.)
 Mugrage, E. R., with Andresen, (256) (Misc.)
 Mühlens, P., (331) (Dys.), 369, 585 (Mal.) 391, 895 (Hel.)
 Muir, K., 308, 599, 908 (Lep.)
 Mukerjee, S., with Smith & Chiranji Lal, 570 (Leish.)
 —, with —, Halder & Lal, 50 (Leish.)
 —, with —, Lal & Halder, 44 (Leish.)
 Mulas, F., 234, 235 (Rab.)
 Mulder, J. G. A., 149 (Mal.)
 Müller, H. & Soetedjo Mertodidjojo, 310 (Lep.)
 Mullick, D. N., with Linton & Mitra, 422 (Chl.)
 Mulligan, H. W. & Baily, J. D., 55 (Mal.)
 — & Majid, S. A., 383 (Mal.)
 Muneuchi, T., 607 (Lep.)
 Murgatroyd, F., 358 (Lept.)
 — & Yorke, W., 531, 532, 533 (Tryp.)
 de Muro, P., with Pozzi, 336 (Dys.)
 Murray, D. R. P., 171 (Mal.)
 Murray, R. E. & Fielding, J. W., 359 (Lept.)
 Musumeci, N., with Ascoli, Missiroli, Bonfigli, Casu, Diliberto, Riolo, Rocca & Terenzio, 618 (Mal.)

Nagamitu, G., 656 (Vms.)
 Nain, M., (861) (Hel.)
 Naito, T. & Oka, S., 129 (Tryp.)
 Nájera Angulo, L., 37 (Hel.)
 Nakashima, Y., with Akashi & Yô, (216) (Mal.)
 Napier, L. E., 257, 516 (Misc.)
 — & Halder, K. C., 576 (Leish.)
 — & Das Gupta, C. R., 500 (Misc.)
 Nash, T. A. M., 111 *bis*, 533 (Tryp.)
 Nataf, R., with Cuénod, 900, 901 (Oph.)
 Nattan-Larrier, L., & Grimard, L., 43 (Leish.)
 — & Noyer, B., 48 *bis* (Leish.)
 Nauck, E. G., 716 (Mal.)
 —, with Giemsa, 496 (Misc.)
 — & Malamos, B., 220 (Mal.)
 Nayar, K. K., with Wright, 899 (Oph.)
 Neal, W. J. L., with Pandit & Rice, 418 (Chl.)
 de Negri, U., 618 (Mal.)
 Negroni, P., 436 (Misc.)
 Neitz, W. O., with Thomas, 237 (Rab.)
 Neuhaus, K., with Bonne, 253 (Misc.)
 Neumann, H., with Schilling, Schreck & Kunert, 125, 554 (Tryp.)
 Nguyen-van-Huong, with Delhove, 851 (Fev.)
 Nguyen Ngoc Nhuan, with Montel R. & Montel, G., 611 (Lep.)
 Nicholas, W. A., 944 (Mal.)
 Nicholls, L., 963 (Y. & S.)
 Nicolas, L., with Berny, 218 (Mal.)
 Nicolau, S. & Kopciowska, L., 231 (Rab.)
 — & Pérard, C., 575 (Leish.)
 Niño, F. L., 136, 936 (Tryp.)
 Nishi, M., 454 (Hel.)
 Nishiyama, M., 514 (Misc.)
 van Nitsen, R., 596, 597 *bis* (Mal.), 800 (Hel.)
 — & Serra, D., 596 (Mal.)
 Niven, J. C., with Field, 615 (Mal.)
 Nolasco, J. O. & Africa, C. M., 30 (Hel.)
 — & Gacoba, C., 386 (Hel.)
 Norman, V., 87 (B.R.)
 Noronha, A. J., (469) (Hel.)
 Nossina, V. D., with Moshkovsky, Demina, Epstein, Melikhan-Shenina, Basina, Pavlova & Wunder, 856 (Fev.)
 —, with —, — Pavlova, Livschitz & Wunder, 856 (Fev.)
 —, with Moshkovsky & Latishev, 856 (Fev.)
 Noyer, B., with Nattan-Larrier, 48 *bis* (Leish.)
 Nozaki, M., with Terada, 912 (Lep.)
 —, with — & Terada, Y., 318 (Lep.)
 Nunan, B., 336 (Dys.)

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Oakley, P. D., 343 (Y.F.)
 Occhino, A. & Kernkamp, Y., 611 (Lep.)
 O'Connor, F. W., 460 (Hel.)
 — & Beatty, H., 33, 884 (Hel.)
 O'Connor, R. J., with Lourie, 123, 555, 922 (Tryp.)
 d'Oelsnitz, 567 (Leish.)
 —, Vian, L. & Barbe, R., 571 (Leish.)
 Ogawa, M., with Mitsuda, 606 (Lep.)
 Ogura, K., 37 (Hel.)

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Ogura, M., with Miyahara, 586 (Mal.)
 Oh, J., 657, 658 (Vms.)
 Ohl, 455 (Hel.)
 Oka, S., with Naito, 129 (Tryp.)
 Okamoto, R. & Masayama, S., (484) (Fev.)
 Okamoto, Y., 853 (Fev.)
 Olitzki, L., with Kligler, 132 (Tryp.)
 Oliver González, J., with Rodriguez Molina, 586 (Mal.)
 Olle, R. G., 563 (Tryp.)
 —, with Mazza, 564 (Tryp.)
 Olpp, G., 496 (Misc.)
 Omar, W., 222 (Mal.)
 Onsy, A., 861 (Hel.)
 Oosthuizen, M. J. & Smit, B., 444 (Misc.)
 Orenstein, A. J., (239) (Misc.)
 Orgel, M. N., with Taussig, 779 (Mal.)
 v. Ortenberg, H., 314 (Lep.)
 Osburn, H. S., 452 (Hel.)
 Otten, L., 417 (Pl.)
 Otto, J. H., 396 (Hel.)
 — & Tschan Tsching Ji, 396 (Hel.)
 Ottolenghi, D., 518 (B.R.)
 Overbeek, J. G., with van Heukelom, A. S., 158, 594 (Mal.)
 Ovtchinikov, K. M., Tischenko, C. D. & Morozova, L. I., 639 (Mal.)

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Pacheco, G. & Proença, M. C., 230 (Rab.)
 Pagonis, A., with Alivisatos & Triantaphyllou, 488 (Fev.)
 Pai, N. G., with Krishnan & Bose, 573 (Leish.)
 Palais, M., 868 (Hel.)
 Palazzo, M. Q., 453, 469 (Hel.)
 Paldrok, A., 905 (Lep.)
 Pampana, E. J., 215, 368, (580) (Mal.)
 Pan, J. S., 943 (Mal.)
 Pandit, C. G., Maitra, N. M. & Datta Roy, B. K., 427 (Chl.)
 — & Rice, E. M., 418 (Chl.)
 —, — & Neal, W. J. L., 418 (Chl.)
 Pandit, S. R., with Taylor & Read, 424, 783 (Chl.)
 Pang Kuo-Hao, 320 (Dys.)
 Panisello, F. S., Jimenez, J. A. & Guernica, A., 23 (Hel.)
 Papandonakis, E., 41 (Leish.)
 Parcerisa, P. J., with Mazza & Idelsohn, (562) (Tryp.)
 Pardo-Castello, V., 250 (Misc.)
 Paris : Office International d'Hygiène Publique, 341 (Y.F.)
 Parma, B., with Mazza & Romaña, (565) (Tryp.)
 Parran, T., with Hazen, Sanford, Senear, Simpson & Vonderlehr, 312 (Lep.)
 Parreiras, D., 50 (Leish.)
 Parrot, G. V., (851) (Fev.)
 Pasqualini, R. Q., with Bacigalupo, 453 (Hel.)
 Pasternak, M., with Tyndel, 237 (Rab.)
 Patel, C., 555 (Tryp.)
 Patiño Camargo, L., 375 (Mal.)
 Patwardhan, V. T., 951 (Am.)
 Paty, R. M., Jr., with Zee, 946 (Mal.)

- Pavlova, E. A., with Moshkovsky & Demina, 856 (Fev.)
 —, with —, —, Nossina, Epstein, Melikhan-Shenina, Basina & Wunder, 856 (Fev.)
 —, with —, —, —, Livschitz & Wunder, 856 (Fev.)
 —, with —, Russinkovskaia & Demina, 856 (Fev.)
 Pawan, J. L., 677 (Rab.)
 Paz Otero, G., 963 (Y. & S.)
 Peacock, W. H., 240 (Misc.)
 Peck, S. M., Rosenthal, N. & Erf, I., 645, 720 (Vms.)
 Peckolt, W. & Prado, A., 334 (Dys.)
 Peel, E., with van Hoof & Henrard, 925, 926 *bis* (Tryp.)
 Peltier, M., 682 (Y.F.)
 Peltin, C., 370 (Mal.)
 Peña Chavarría, A. & Rotter, W., 28 (Hel.)
 Penfold, H. B., 21, 868 *bis* (Hel.)
 —, with Penfold, W. J. & Phillips, 401, 805 (Hel.)
 Penfold, W. J. & Penfold, H. B., 21, 806 (Hel.)
 —, — & Phillips M., 22, 805 (Hel.)
 Penna, H. A., 347 (Y.F.)
 Pennanéach, J., with Le Chuiton & Berge, 479 (Fev.)
 Pennington, E. S., 179 (Der.)
 Penso, G., 398 (Hel.)
 Peragallo, I., 672 (Rab.)
 Pérard, C., with Mesnil & Leger, 126 (Tryp.)
 —, with Nicolau, 575 (Leish.)
 Pereira, C. & Vaz, Z., 23 (Hel.)
 Pereira, L., (613) (Lep.)
 Pereira, O. L., with de Mello, 302 (Lep.)
 Perez, M., with Earle, 161 (Mal.)
 Perez, M. A., with Morales Otero, Ramirez Santos, Espino, Ramú, Fuster, González & Marrero, 810 (Misc.)
 Pergher, G., 477 (Fev.)
 Perilli, R., with Tagliabue, 165 (Mal.)
 Pervès, M., 245 (Misc.)
 Peter, F. M., with Schmidt, 669 (B.R.)
 Petresco, M., with Danielopolu, Lupu & Craciun, 483 (Fev.)
 Pfister, C. R., 407 (Pl.)
 Phan-huy-Quat, with Galliard, 866 (Hel.)
 —, with — & Autret, (16) (Hel.)
 —, with — & Dang-van-Ngu, (16) (Hel.)
 Philip, C. B., 853 (Fev.)
 Phillips, M., with Penfold, W. J. & Penfold, H. B., 22, 401, 805 (Hel.)
 Pieri, J. & Bouet, (38) (Hel.)
 —, —, Flori & Aubanel, 617 (Mal.)
 — & Sardou, 394 (Hel.)
 —, — & Battesti, 841 (Bl.)
 Pierini, L. E. & Bosq, P., 966 (Y. & S.)
 Pijper, A., 850 (Fev.)
 Pimentel Imbert, M. F., 609 (Lep.)
 Pinkerton H., with Hass, 470 (Fev.)
 —, with Sellards, 317 (Lep.)
 Pistoni, F., 775 (Mal.)
 Planet, N., with Bier, 914 (Lep.)
 Plantilla, F. C., 307 (Lep.)
 Plazy, L., 482 (Fev.)
 Plum, P., 254 (Misc.)
 Podiapolska, 25 (Hel.)
 Poindexter, H. A., with Bennett, R. I., 115 (Tryp.)
 Pollitzer, R., 423, 426 (Chl.)
 Pomales Lebrón, A., with Morales Otero, 463, 889 (Hel.)
 Pomilia, 598 (Mal.)
 Pondé, A., 151 (Mal.)
 Pons, J. A., 462 (Hel.)
 —, with Rodriguez Molina, 799 (Hel.)
 Poole, L. T., with Shortt & Stephens, 489 (Fev.)
 Pooman, A., 312, 315 (Lep.)
 Popesco, M., with Simici & Covaceano, 515 (Misc.)
 Popescu, M., with Simici & Covaceanu, 335 (Dys.)
 Popow, P. P. & Achundow, I., 354 (R.F.)
 Porter, A., with Fantham, 510 (Misc.)
 Porter, D. A., with Schwartz, 876 (Hel.)
 Portugal, H., with Anderson, H. H., Cerqueira & Anderson, J. van D., 311 (I.ep.)
 Portuondo del Pino, A., with Fermoselle Bacardi, 400 (Hel.)
 Pot, A. W., 359 (Lept.)
 — & Dornickx, C. G. J., 359 (Lept.)
 Potts, W. H., 538 (Tryp.)
 Pozzi, A. & de Muro, P., 336 (Dys.)
 Prado, A., with Peckolt, 334 (Dys.)
 Prashad, B. & Hora, S. L., 382 (Mal.)
 Pridie, E. D., 337, 681 (Y.F.)
 Prieur, M., with Launoy & Ancelot, 128 (Tryp.)
 Proença, M. C., with Pacheco, 230 (Rab.)
 Protasov, N., with Ackermann, 351 (R.F.)
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 Purcell, F. M., 854 (Fev.)
 Puri, I. M., (164) (Mal.)
 Putzu, F., 20 (Hel.)

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 Quenardel, (30) (Hel.)

R.

- Rachmanow, H., 335 (Dys.)
 Radacovici, E., with Zotta & Dimitriu, 866 (Hel.)
 Radhakrishna Rao, M. V., (39) (Hel.)
 —, with Tirumurti, 152 (Mal.)
 Radvan, I. & Alexandrescu, D., 777 (Mal.)
 Raffaele, G., 219 (Mal.)
 Ragirot, C. (64) (Mal.)
 — & Delbove, P., 480 (Fev.)
 —, with Fabry & Guillermin, 583 (Mal.)
 — & Moreau, P., 64, 65, 777 (Mal.)
 Ragu, J., with Flandin, 600, (915) (Lep.)
 —, with — & Baranger, 314 (Lep.)
 Raimondi, A. A. & Sangiovanni, A., 665 (Vms.)
 Raj, M. P., with Cochrane, 612, 916 (Lep.)
 Raja Ram, with Sinton, 939 (Mal.)
 Rakhmanova, E., with Efendiev, Adjalov, Vinnitski, Glashkina, Melikova, Sadykhov & Tariverdiev, 216 (Mal.)

- Rakoff, A. E., with Bland, 513 (Misc.)
 Rambert, P., with Boudin, 481 (Fev.)
 Ramijean, R., Farinaud, M. E. & Tran-Van-Tam, 701 (R.F.)
 —, Huong, N. V. & Farinaud, M., 700 (R.F.)
 Ramirez, B., 42 (Leish.)
 Ramirez Santos, R., with Morales Otero, Perez, Espino, Ramú, Fuster, González & Marrero, 810 (Misc.)
 Ramond, L., 360 (R.B.F.)
 Ramsay, G. C. & MacDonald, G., 378 (Mal.)
 Ramú, A., with Morales Otero, Perez, Ramirez Santos, Espino, Fuster, González & Marrero, 810 (Misc.)
 Rankov, M., 145 (Mal.)
 Rao, B. A. & Cheluvvarayan, C., 217 (Mal.)
 Rao, P. R., with Tirumurti, 151 (Mal.)
 Rao, S. S., 467 (Hel.)
 Ray, P. N., 463 (Hel.)
 —, with Banerji & Chopra, 331 (Dys.)
 Raybaud, A., 789 (Pl.)
 Raynal, J., with Gaschen, 164 (Mal.)
 —, Vaucel, M. & Hoang-Tich-Try, (210) (Mal.)
 Rduch, H., 617 (Mal.)
 Read, W. D. B., 786 (Chl.)
 —, with Taylor & Pandit, 424, 783 (Chl.)
 Rector, N. H., with Riley, 943 (Mal.)
 Redaelli, P., 508 (Misc.)
 — & Ciferri, R., 510 *bis* (Misc.)
 —, with —, 510 (Misc.)
 —, with — & Scatizzi, (251) (Misc.)
 Reed, A. C., 73 (Sp.)
 Reed, J. G., (711) (Mal.)
 Regules, U., with Scicardi, 176 (Der.)
 Reichel, J. & Schneider, J. E., 236 (Rab.)
 Reinié, L., with Levaditi & Schoen, 678 *bis* (Rab.)
 Remlinger, P. & Bailly, J., 233, 237, 672 *bis*, 673 (Rab.)
 Repetto, R. L., (805) (Hel.)
 Reirre, J. I., with Chambers & Saunders, 959 (Y. & S.)
 Reuter, J., (170), 630 (Mal.)
 Reyntjens, 597 (Mal.)
 Rhoads, C. P., & Miller, 83 (Sp.)
 Rhodesia, Southern, 917 (Tryp.)
 Ribeiro, D. J., with Dias & Martins, 845 (Fev.)
 Rice, E. M. & Mohan, B. N., 379 (Mal.)
 —, with Pandit, 418 (Chl.)
 —, with — & Neal, 418 (Chl.)
 Rice, J. B., with Barber, 168, 711 (Mal.)
 —, with — & Mandekos, 139, 144, 170, 939 (Mal.)
 Richardson, S., 592 (Mal.)
 Rickard, E. R., 686 (Y. F.)
 Rifling, E. A., with Ul'Yanishchev, 637 (Mal.)
 Riley, G. E., Faust, E. C. & Cook, S. S., (943) (Mal.)
 — & Rector, N. H., 943 (Mal.)
 Rimbaud, L., Janbon, M. & Labraque-Bordenave, 705 *bis* (Lept.)
 Riolo, P., 598 (Mal.)
 —, with Ascoli, Missiroli, Bonfigli, Casu, Diliberto, Musumeci, Rocca & Terenzio, 618 (Mal.)
 van Riper, W., with d'Amour & Becker, 728 (Vms.)
 Rivoalen, A., with Durieux & Mathias, 845 (Fev.)
 Robert, J., 802 (Hel.)
 Robert, W. P., 66 (Mal.)
 Roberts, J. I., 404, 405, 406 (Pl.)
 Robertson, A., with Thomson, 588 (Mal.)
 Robertson, R. C., 389 (Hel.)
 Robic, J., 321 (Dys.)
 Robic, M., 791 (Pl.)
 Robin, C. & Jospin, M., 927, 928 (Tryp.)
 Robin, L. A., 620 (Mal.)
 Robinson, S. S., 117 (Tryp.)
 Rocca, with Ascoli, Missiroli, Bonfigli, Casu, Diliberto, Musumeci, Riolo & Terenzio, 618 (Mal.)
 Rockefeller Foundation, 85 (B.R.)
 Rodhain, J., 625 (Mal.), 938 (Tryp.)
 — & van Hoof, M. T., 515 (Misc.)
 Rodriguez, J., 304, 907 (Lep.)
 Rodriguez-Garcia, J. A., with Mackinnon, 180 (Der.)
 Rodriguez Molina, R., with Bachman, Hoffman & González, 872 (Hel.)
 — & Hoffman, W. A., 803 (Hel.)
 — & Oliver González, J., 586 (Mal.)
 — & Pons, J. A., 799 (Hel.)
 Roldán, A., 661 (Vms.)
 Rolleston, H., 357 (Lept.)
 Rolufs, L. S., with Bengtson, 492 (Oph.)
 Roman, E., with Morenas, 928 (Tryp.)
 Romaña, C., (137) (Tryp.)
 —, with Mazza & Parma, (565) (Tryp.)
 —, with — & Zambra (565), (Tryp.)
 Romanenko, A. P., 584 (Mal.)
 Romiti, C., (463) (Hel.)
 Röper, E., with Ruge, 935 (Tryp.)
 Rosa, A. & Maccolini, R., 160 (Mal.)
 —, Valli, E. S. & Maccolini, R., 216 (Mal.)
 Rose, A. W., with Lovett-Campbell, 393 (Hel.)
 Rose, F. G., 312, 915 (Lep.)
 Rose, G., 864 (Hel.)
 — & Koh, 864 (Hel.)
 — & Wang, B. L., 374 (Mal.)
 Rosenbaum, M., with Merritt, 32 (Hel.)
 Rosenthal, N., with Peck & Erf, 645, 720 (Vms.)
 Rosier, H. J., 407 (Pl.)
 Roskin, G. & Schischlajewa, S., 119 (Tryp.)
 Ross, G. A. P., 58 (Mal.), 239 (Misc.)
 Ross, I. C., 878 (Hel.)
 Rossi, P., 673 (Rab.)
 Rotberg, A., 612 (Lep.)
 Roth, H., 32 (Hel.)
 Rotter, W., with Peña Chavarria, 28 (Hel.)
 Roubaud, E., 125 (Tryp.), 265 (Misc.), 891 (Hel.)
 — & Colas-Belcours, J., 109 (Tryp.), 633 (Mal.), 891 (Hel.)
 — & Treillard, M., 633 (Mal.)
 —, — & Toumanoff, C., 503 (Misc.)
 Roudabush, R. L., with Coatney, 511 (Misc.)
 Roy, A. C., 233 (Rab.)
 —, with Chopra, 627 (Mal.)
 —, with — & Das Gupta, 626 (Mal.)
 —, with — & Ganguly, 66 (Mal.)
 —, with — & Sen, 596 (Mal.)

Roy, D. N., 349 (Y.F.)
 —, with Strickland, 162 (Mal.)
 Rozeboom, L. E., 67, 634 (Mal.), 136 (Tryp.)
 Rubinstein, B. N., 173 (Mal.)
 Ruffin, J. M. & Smith, D. T., 433 (Misc.)
 Ruge, H., 153, 626 (Mal.)
 — & Röper, E., 935 (Tryp.)
 Rugina, I., with Balteanu, Alexa, I., Alexa, E.,
 Stretcu, Boeru & Urzica, 146 (Mal.)
 Ruiz, C. & de Landazuri, O., 846 (Fev.)
 Russell, A. J. H., 25 (Hel.)
 Russell, H., 120 (Tryp.)
 Russell, P. F., 372 (Mal.)
 — & Baisas, F. E., 163 (Mal.)
 Russinkovskaia, E. B., with Moshkovsky,
 Demina & Pavlova, 856 (Fev.)
 Ryo, S., 806 (Hel.)

S.

Sacramento, A. A., 904 (Lep.)
 Sadykhov, A., with Efendiev, Adjalov,
 Vinnitski, Glashkina, Melikova, Rakh-
 manova & Tariverdiev, 216 (Mal.)
 Saim, A., 361 (R.B.F.)
 Saito, Y., 569, 570 (Leish.)
 Salab, M., 260 (Misc.), (595) (Mal.)
 Saleun, G., 919 (Tryp.)
 —, with Laigret & Ceccaldi, 688 (Y.F.)
 Saliba, N., 613 (Lep.)
 Salle, A. J. & Moser, J. R., 910 (Lep.)
 Sampedro, M. M., (229) (Bl.)
 Samson, J. G., 307 (Lep.)
 Sanchez, O. B., with Mazza, (938) (Tryp.)
 Sánchez Botija, C., 46 (Leish.)
 Sanders, J. P., 64 (Mal.)
 Sanders, J. T., with King & Faust, 858 (Hel.)
 Sandground, J. H., 457 (Hel.)
 Sandiford, B. R., 709 (Lept.)
 Sanford, A. H., with Hazen, Parran, Senear,
 Simpson & Vonderlehr, 312 (Lep.)
 Sangiorgi, G., 570 (Leish.)
 Sangiovanni, A., with Raimondi, 665 (Vms.)
 Sanner, A., Destribats & Albrand, 888 (Hel.)
 Santra, I., 903 (Lep.)
 Sanyal, S., 491 (Oph.)
 Sardjito & Mochtar, A., 911 (Lep.)
 Sardjito, M., with Kuilman & Kaiser, 813
 (Misc.)
 —, with Leimena, 433 (Misc.)
 Sardou, M., with Brahic, (441) (Misc.)
 —, with Giraud, Montus & Gaubert,
 574 (Leish.)
 Sardou, with Pieri, 394 (Hel.)
 —, with — & Battesti, 841 (Bl.)
 Sargent, R. M., 797 (Hel.)
 Sarkar, S. L. & Bhattacharya, B. M., 916
 (Lep.)
 Sarkissian, M., with Ter-Matevossian &
 Zaturian, 326 (Dys.)
 Sassuchin, D., 511 (Misc.)
 Sato, M., with Yamamoto & Sato, Y., 319
 (Lep.)
 Saunders, G. M., 959, 967 (Y. & S.)
 —, Chambers, H. D. & Rerrie, J. I., 959
 (Y. & S.)
 Sauterey, P., 357 (R.F.)
 Sautet, J., (170) (Mal.)

Sautter, V., with Lépine, 231 (Rab.)
 Savagnone, L., 675 (Rab.)
 Savon Salaberry, J., 577 (Leish.)
 Savor, S. R., with Lewthwaite, 473, 474
 (Fev.)
 —, with — & Hodgkin, 472 (Fev.)
 Sawyer, W. A., 686 (Y.F.)
 — & Bauer, J. H., 339 (Y.F.)
 —, — & Whitman, L., 680 (Y.F.)
 Scatizzi, I., with Ciferri & Redaelli, (251)
 (Misc.)
 Schäfer, H., 778 (Mal.)
 Schapiro, M. M., 806 (Hel.)
 Scharff, J. W., 71, 148 (Mal.)
 —, with Williamson, 213 (Mal.)
 Schechter, A. J. & Taylor, H. M., 594 (Mal.)
 Scheff, G. & Hasskó, A., 130 (Tryp.)
 Scheffley, C. H., 883 (Hel.)
 Schern, K. & Artagaveytia-Allende, R.,
 132, 553 (Tryp.)
 Schieber, H., with Adler & Theodor, 696
 (R.F.)
 Schilling, C., 124 *ter*, 125, 554 (Tryp.)
 —, with Schreck, H., Neumann, H. &
 Kunert, H., 125, 554 (Tryp.)
 Schischliajewa, S., with Roskin, 119 (Tryp.)
 Schmidt, H. & Peter, F. M., 669 (B.R.)
 Schmuttermayer, F., 65 (Mal.)
 Schneider, J. E., with Reichel, 236 (Rab.)
 Schoen, R., with Levaditi, 233 (Rab.)
 —, with — & Reinié, 678 *bis* (Rab.)
 Schönfeld, W., 451 (Hel.)
 Schotman, J. W., with IJermans, 248 (Misc.)
 Schourenkova, A. & Mekhanikova, V., 141
 (Mal.)
 Schoute, E., with Swellengrebel, de Buck &
 Kraan, 143 (Mal.)
 Schreck, H., with Schilling, Neumann &
 Kunert, 125, 554 (Tryp.)
 Schroeder, C. R., with MacKay, 232 (Rab.)
 Schuffner, W. A. P. & Esseveld, H., 383 (Mal.)
 — & Walch-Sorgdrager, B., 704 (Lept.)
 Schujman, S., 605 (Lep.)
 Schwartz, B. & Porter, D. A., 876 (Hel.)
 Schweinburg, F., with Gerlach, 673 (Rab.)
 Schwetz, J., 924 (Tryp.)
 Schwoerer, P., with Diehl, 872 (Hel.)
 Scott, D. T., 638 (Mal.)
 Scott, J. A., 859 *bis*, 862 (Hel.)
 Scotti, C., 956 (Am.)
 Seal, S. C., 785 (Chl.)
 —, with Linton & Mitra, 425 *bis* (Chl.)
 —, with Shrivastava, 784 (Chl.)
 Sédan, J., 491, 899 (Oph.)
 Seelig, S. F. & Singh, W., 158 (Mal.)
 Seetharama Iyer, P. V., with Menon, 34 (Hel.)
 Seiffert, G., 429 (Chl.), 496 (Misc.), 694 (Y.F.)
 Seiler, J., 659 (Vms.)
 Selivanov, K. L., 945 (Mal.)
 Sellards, A. W. & Laigret, J., 688 (Y.F.)
 Sellards, M. A. W. & Pinkerton, H., 317 (Lep.)
 Sellers, W., with Cauchi & Bunkall, 637 (Mal.)
 Sen, B., with Chopra & Gupta, 956 (Am.)
 —, with — & Roy, 596 (Mal.)
 Sen, S. C., 20 (Hel.)
 Senear, F. E., with Hazen, Parran, Sanford,
 Simpson & Vonderlehr, 312 (Lep.)
 Senevet, G., (170) (Mal.)
 —, Witas, P. & Lièvre, H., 805 (Hel.)

- Séno-Sastroamidjojo, R., 717 (Mal.)
 Serefettin, O., 481 (Fev.)
 Sergeant, Edm., 778, 779, 780 (Mal.)
 Sergeant, Et., 67, 69 (Mal.), 721, 727, 728 *bis* (Vms.)
 Serio, F., 598 (Mal.)
 Serra, D., with van Nitsen, 596 (Mal.)
 Serra, G., (148), 775 (Mal.)
 Setter, C. G., with Holden, (648) (Vms.)
 Shaw, A. F. B., 260 (Misc.)
 Shillong, 428 (Chl.)
 Shimkin, N. I., 899 (Oph.)
 Shiraogawa, H., 329 (Dys.)
 Shortt, H. E., Poole, L. T. & Stephens, E. D., 489 (Fev.)
 Shrivastava, D. L. & Seal, S. C., 784 (Chl.)
 Shushan, M., Blitz, O. & Adams, C. C., 585 (Mal.)
 Shute, P. G., 220, 780 (Mal.)
 Sibilia, D., 698 (R F.)
 Sicardi, J. A. & Regules, U., 176 (Der.)
 Sicault, G., 169, 943, 945 (Mal.)
 —, with Jolly, 621 (Mal.)
 — & Messerlin, A., 64, 381 (Mal.)
 —, with —, 714 (Mal.)
 —, —, Lummau, J. & Fritz, J., 168 (Mal.)
 Sicé, A., 738 (B.R.)
 — & Bonnet, P., 548 (Tryp.)
 —, with Galliard, 893 (Hel.)
 Siegenbeek van Heukelom, A., 433 (Misc.)
 — & Overbeek, J. G., 594 (Mal.)
 Sierra Leone, 343 (Y F.)
 Sifferlen, J., with Troisier, 708 (Lept.)
 Sigon, M. & Migone, L., 486 (Fev.)
 da Silva, C., 385 (Hel.)
 Silva, F., 178 (Der.)
 Silverie, M., (861) (Hel.)
 Simatchkova, M. S., 221 (Mal.)
 Simici, D., Popescu, M. & Covaceanu, C., 335 (Dys.), 515 (Misc.)
 Simitch, T., 373, 713 (Mal.), 949 (Am.)
 Simmons, J. S., 167 *bis*, 712 (Mal.)
 Simon & Darbes, 207 (Mal.)
 de Simon, D. S., with Cochrane & Fernando, (606) (Lept.)
 Simpson, W. M., with Hazen, Parran, Sanford, Senear & Vonderlehr, 312 (Lept.)
 Sindoni, M., 451 (Hel.)
 Singh, H., with Wilson, 231 (Rab.)
 Singh, W., with Seelig, 158 (Mal.)
 Sinton, J. A., 219 (Mal.)
 —, with Christophers & Covell, 773 (Mal.)
 — & Raja Ram, 939 (Mal.)
 van Slype, W., 216 (Mal.)
 Smit, B., with Oosthuizen, 444 (Misc.)
 Smit, H. P., 238 (Misc.)
 Smith, C. N., with Bishopp, 58 (Mal.)
 Smith, D. T., with Ruffin, 433 (Misc.)
 Smith, H. H., with Elmendorf, 692 (Y.F.)
 — & Theiler, M., 691 (Y.F.)
 —, with —, 339, 690, 691 (Y.F.)
 Smith, J., 710 (Lept.)
 Smith, R. O. A., Lal, C., Mukerjee, S. & Halder, K. C., 44 (Leish.)
 —, Mukerjee, S. & Chiranji Lal, 570 (Leish.)
 —, —, Halder, K. C. & Lal, C., 50 (Leish.)
 Smith, S. W., 87 (B.R.)
 Smith, W. H. Y., McAlpine, J. G. & Gill, D. G., 874 (Hel.)
 Smyly, H. J. & Chang, K., 509 (Misc.)
 Snell, A. M., 75 (Sp.)
 Snijders, E. P., (73) (Sp.)
 Soares, J. A., 904 (Lept.)
 Sobky, M., 155 (Mal.)
 Soeharto, R., 740 (B.R.)
 Soetedjo Mertodidjojo, with Müller, 310 (Lept.)
 Soetjahjo, M., (397) (Hel.)
 Soetomo, R., 309 (Lept.)
 Softeff, M. S., with Khodukin, & Kevorkoff, 570 (Leish.)
 Sokhey, S. S., 402 (Pl.)
 — & Maurice, H., 790 (Pl.)
 Sokolov, N. P., 381 (Mal.)
 — & Chvaliova, M. A., 382 (Mal.)
 Sollier, L. F. & Boutareau, C., 812 (Misc.)
 de Sommerville, E. T. W., with Dios, Bonacci & Aldao, 563 (Tryp.)
 Soper, F. L., 344, 685 (Y.F.)
 Sorel, 337 *bis* (Y F.), 914 (Lept.)
 Sorge, G., 776 (Mal.)
 Sotiriadès, D., 639 (Mal.)
 —, with Lorando, 63 (Mal.)
 Souchard & Tournier, 854 (Fev.)
 Souchard, L., 207 (Mal.)
 Soulage, with Mercier, 554 (Tryp.)
 Soulié, P., 135 (Tryp.)
 Soulier, R., with Vaucel, 706 (Lept.)
 Souter, J. C., 180 (Der.)
 de Souza Araujo, H. C., 904, 909 (Lept.)
 Soviet Union Year Book Press Service, 145 (Mal.)
 Spaar, E. C., (269) (Misc.), (597) (Mal.)
 Spaeth, E. B., 493 (Oph.)
 Spanedda, A., 590 (Mal.)
 Sparrow, H., 849, 851 *bis*, 852 (Fev.)
 Sparrow-Germa, H., 848 (Fev.)
 Spector, B. K., 327, 330 (Dys.)
 Spence, T., with de Verteuil, 582 (Mal.)
 Spies, T. D., 182 (Der.)
 —, Chinn, A. & McLester, J. B., 434 (Misc.)
 Spink, W. W., 458 (Hel.)
 Stage, H. H. & Yates, W. W., 694 (Y.F.)
 Stanesco, M. & Enachesco, S. D., 817 (Misc.)
 Stannus, H. S., 958 (Y. & S.)
 Stanton, T., 337 (Y.F.)
 Starzyk, J., 849 (Fev.)
 Stefanopoulo, G. J., Laurent, P. & Wassermann, R., 346 (Y.F.)
 Stephens, E. D., with Covell, McGuire & Lahiri, 236 (Rab.)
 —, with Shortt & Poole, 489 (Fev.)
 Stephens, J. W. W., 736 (B.R.)
 Sterling, R. & Guay, A. J. L., 449 (Hel.)
 Stewart, J. L., 117, 523 (Tryp.)
 Stiven, H., 798 (Hel.)
 Stock, P. G., 683 (Y.F.)
 Stone, W. S., 324 *ter* (Dys.), 504 (Misc.)
 Strandel, B., 84 (Sp.)
 Strandell, B., 182 (Der.)
 Stratman-Thomas, W. K. & Baker, F. C., 62 (Mal.)
 —, with Boyd & Kitchen, 173 (Mal.)
 Stretcu, I., with Baiteanu, Alexa, I., Alexa, E., Rugina, Boeru & Urzica, 146 (Mal.)

Strickland, C., 367, 580 (Mal.)
 — & Chaudhuri, H. P., 57 (Mal.)
 — & Gupta, S. C. S., 164 (Mal.)
 — & Roy, D. N., 162 (Mal.)
 Ströder, J., 557 (Tryp.)
 Strong, R. P., 493 (Oph.), 894 (Hel.)
 Su, T. L. & Huang, T. F., 940 (Mal.)
 Suarez, J., 462 (Hel.)
 Suarez, R. M., 81 (Sp.)
 — & Benitez Gautier, C., 388 (Hel.)
 Subrahmanyam, C., 475 (Fev.)
 Sudan, 118 (Tryp.)
 Sudan Medical Service Report, 681 (Y.F.)
 Suga, Y., 802 (Hel.)
 Sugio, K., with Suzuki, (648) (Vms.)
 Sulzberger, M. B. & Kaminstein, I., 181 (Der.)
 Sun, C. J., with Yao, 47 (Leish.)
 —, —, Chu, H. J. & Wu, C. C., 44 (Leish.)
 Sundar Rao, S., 33 (Hel.)
 Sur, P., 210 (Mal.)
 Suzuki, C. & Sugio, K., (648) (Vms.)
 Swaroop, S., with White, Lal & Adhikara, 380 (Mal.)
 Sweet, W. C., with Moorthy, 35, 464, 465, 466 (Hel.)
 Swellengrebel, N. H., de Buck, A., Kraan, M. H. & van der Torren, G., 69 (Mal.)
 —, —, Schoute, E. & Kraan, M. H., 143 (Mal.)
 Swynnerton, C. F. M., 363 (B R.), 543 (Tryp.)
 Symes, C. B., 628 (Mal.)
 —, with Evans, 629 (Mal.)
 — & McMahon, J. P., 541 (Tryp.)
 — & Vane, R. T., 542 (Tryp.)
 Symons, P. H., 255 (Misc.)
 Szappanos, G., with Lörincz & Makara, 265 (Misc.)
 Szauter, B., 590 (Mal.)

T.

Taddia, L., 699 (R.F.)
 —, with Mariani, 584 (Mal.)
 Tagliabue, C. & Perilli, R., 165 (Mal.)
 Takiyama, U., with Akamatsu, 252 (Misc.)
 Talamonti, L., 386 (Hel.)
 Talec & Montglond, 315 (Lep.)
 Taliaferro, W. H. & Cannon, P. R., 622 (Mal.)
 Talice, R. V., 176 *ter*, 177 (Der.)
 Tang, C. C., 390 (Hel.)
 T'ang Tze-Kuang, 707 (Lept.)
 Tanguy, Y., with Darré, Mollaret & Mercier, 546 (Tryp.)
 Tarassov, V. A., 398 (Hel.)
 Tariderdiev, G., with Efendiev, Adjalov, Vinnitski, Glashkina, Melikova, Rakhmanova & Sadykhov, 216 (Mal.)
 Tate, P., with James, 589 (Mal.)
 Taussig, A. E. & Orgel, M. N., 779 (Mal.)
 Taylor, H. M., with Schechter, 594 (Mal.)
 Taylor, J., 421 (Chl.)
 — & Mallick, S. M. K., 645 (Vms.)
 —, — & Ganguly, S. N., 645 (Vms.)
 —, Pandit, S. R. & Read, W. D. B., 783 (Chl.)
 —, Read, W. D. B. & Pandit, S. R., 424 (Chl.)
 Teixeira, J. C., with Villela, 875 (Hel.)

Teng, C. T., 45 (Leish.)
 — & Forkner, C. E., 45 (Leish.)
 Tennent, J. H., 487 (Fev.)
 Tenorio Nieto, A., 150 (Mal.)
 Terada, M. & Nozaki, M., 912 (Lep.)
 —, Terada, Y. & Nozaki, M., 318 (Lep.)
 Terada, Y., with Terada, M. & Nozaki, 318 (Lep.)
 Terenzio, with Ascoli, Missiroli, Bonfigli, Casu, Diliberto, Musumeci, Riolo & Rocca, 618 (Mal.)
 Ter-Matevossian, S., Sarkissian, M. & Zaturian, A., 326 (Dys.)
 Tesch, J. W. (303) (Lep.), 890 (Hel.)
 Tessitore, C., 252 (Misc.)
 Tetsch, C. & Wolff, K., 648 (Vms.)
 Thaysen, T. E. H., 75 (Sp.)
 Theiler, M. & Smith, H. H., 339, 690, 691 (Y.F.)
 —, with —, 691 (Y.F.)
 Theodor, O., 490 (Fev.)
 —, with Adler & Schieber, 696 (R.F.)
 Thierfelder, M. U., 309 (Lep.), 416 (Pl.)
 Thomas, A. D. & Neitz, W. O., 237 (Rab.)
 Thompson, J. E., 18 (Hel.)
 Thompson, T. O., 221 (Mal.)
 Thomson, J. G. & Robertson, A., 588 (Mal.)
 Thorne, R. T., with Higgins, 664 (Vms.)
 Thornton, E. N., 402 (Pl.), 795 (Hel.)
 Thurmon, F. M. & Chaimson, H., 440 (Misc.)
 Thygeson, P., 492 (Oph.)
 Tilli, P., 715 (Mal.)
 Timbal, G., 25 (Hel.)
 Timpano, P., (51) (Leish.), (174) (Mal.)
 Tirumurti, R. B. T. S. & Rao, P. R., 151 (Mal.)
 Tirumurti, T. S. & Radhakrishna Rao, M. V., 152 (Mal.)
 Tischenko, C. D., with Ovtchinikov & Morozova, 639 (Mal.)
 Tisseuil, J., 316, 612, 915 *bis* (Lep.), 714 (Mal.)
 Tolentino, J. G., 314, (909), 916 (Lep.)
 Tomita, S., 867 (Hel.)
 Tomoyama, K., 657 (Vms.)
 Tonnoir, A. L., 264 (Misc.)
 Toporkov, T. M., 62 (Mal.)
 Torres, S., 677 (Rab.)
 — & Lima, E. Q., 230 *bis*, 676 (Rab.)
 Toullec, 73 (Sp.)
 Toumanoff, C., 517 (B.R.)
 —, with Roubaud & Treillard, 503 (Misc.)
 Tournier, with Souchart, 854 (Fev.)
 Townsend, E. W., 60 (Mal.)
 Tracy, R. L., with Hoyt, Fisk & Moore, 236 (Rab.)
 Trantas, A., 900 (Oph.)
 Tran-Van-Tam, with Ramijean & Farinaud, 701 (R.F.)
 Trawinski, A., 32 (Hel.)
 Tregouet, (210) (Mal.)
 Treillard, M., with Roubaud, 633 (Mal.)
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